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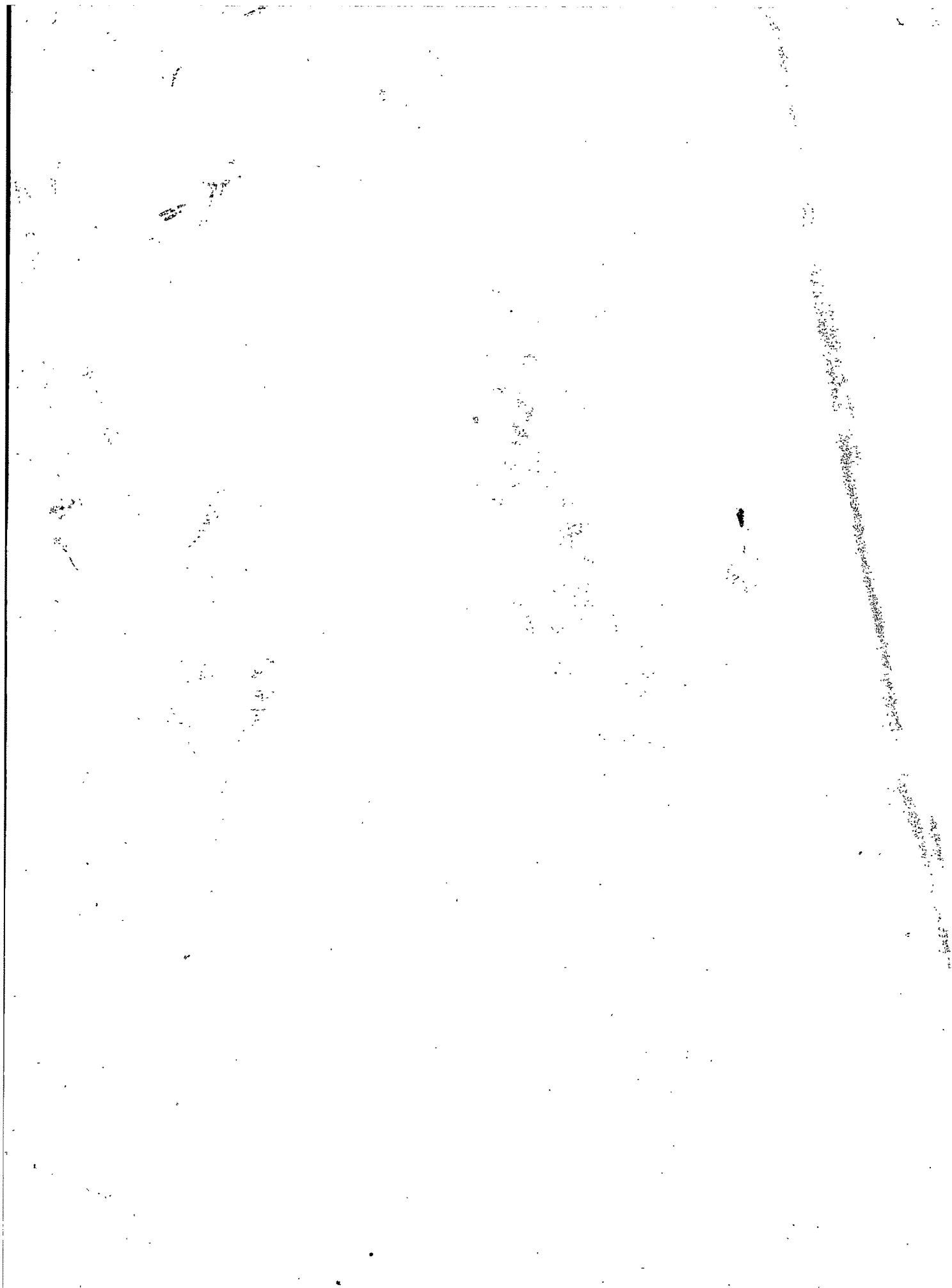
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Interaction Effects in CCA Valuations

K. V. Peasnell

A disappointing feature of the Report of the Inflation Accounting Committee¹ is the scant consideration it gives to the allocation problem in financial accounting. Professor Thomas' argument that depreciation allocations are arbitrary and lacking in real-world counterparts, carefully and convincingly put forward in two recent monographs,² seems to have been overlooked or ignored by the Committee; and yet the Current Cost Accounting (CCA) system recommended in the Report to supplant the extant historical cost system is equally open to Thomas' criticisms. Depreciation in CCA, though based on current values, will still be arbitrarily determined. Moreover it is argued in this paper that the determination of the 'value to the business' of an enterprise's assets in the CCA system, *even of its non-depreciating assets*, is also arbitrary.

The paper consists of two main sections. The first deals with the problem of determining the Value to the Business of a firm's assets (including its intangible assets) when non-constant returns to scale are present. In the second section the impact of uncertainty is explored in some detail. In both sections it is shown that the Value to the Business of individual assets is, to a certain extent at least, indeterminate.

1 Asset valuation and variable returns to scale

In keeping with much of the accounting literature, the Sandilands Report deals with 'intangibles' as an afterthought. Consider, for example, the following statement in the Report (para. 590): 'The principles of Current Cost Accounting would require that assets such as patents, goodwill, and expenditure on research and development [to the extent that it is carried

forward on the balance sheet] should be shown at their "value to the business".' Seemingly sensible though this is at first sight,³ we argue below that goodwill and intangibles are but interaction effects and these interaction effects cannot be handled satisfactorily in the CCA system. This important point seems to have been ignored by the Committee.

As was noted as long ago as 1929 by Canning,⁴ goodwill and intangibles arise when the value of the whole enterprise – or a large segment thereof – exceeds the sum of the individual 'values' of the tangible assets owned by the entity. That is, goodwill exists when additional value arises on the combining of assets. Thomas argues that such interaction or combination effects are likely to be the rule rather than the exception:

'Inputs interact in producing output, revenues or cash-flows whenever the amounts produced by the inputs working together differ from the total that these inputs would have produced working separately . . . The combination of buildings, workers, and machines generates more output than the total of what would be produced by empty buildings, and workers and machines exposed to the weather'.⁵

Any attempt to partition this excess output – or its value – into various categories of 'intangibles' is bound to result in an unexplained residual; this residual is the consequence of arithmetically comparing incommensurables. It is scarcely possible to define, let alone measure, in any meaningful sense of the word, the Value to the Business of this residual.

Thomas argues that only when there are constant returns to scale can the contributions of different

¹*Inflation Accounting: Report of the Inflation Accounting Committee*, Cmnd. 6225 (London: HMSO, 1975), widely referred to as the Sandilands Report.

²Arthur L. Thomas, *The Allocation Problem in Financial Accounting Theory*, Studies in Accounting Research No.3 (American Accounting Association, 1969); and *The Allocation Problem: Part Two*, Studies in Accounting Research No. 9 (American Accounting Association, 1974). These are referred to in this paper as SAR 3 and SAR 9, respectively.

³Professor Richard Morris has pointed out in correspondence that this paragraph of the Report, interpreted literally, implies the valuation of the whole enterprise as a going concern and this, of course, conflicts with other opinions voiced by the Committee on what constitutes an appropriate level of aggregation for accounting. A similar observation subsequently appears in ED18. See Accounting Standards Committee, *ED18: Current Cost Accounting*, issued 30 November 1976, para. 226; also see paras. 50–60 and 219–224 of the same.

⁴J. B. Canning, *The Economics of Accountancy* (Ronald Press, 1929), p. 42.

⁵SAR 9, pp. 15–16.

resources to joint output be identified in a non-arbitrary fashion.⁶ Constant returns to scale are unlikely to be the norm in industry.⁷

Thomas' masterly discussion of the matter notwithstanding, the above assertion is of such critical importance to our argument that further elaboration is required. The Thomas argument runs as follows. When the net revenue contributed by the firm's resources can be ascribed to those resources in a simple, linear, additive way then the allocation is unambiguous and defensible. However problems arise when the contributions of some of the resources interact in some way; see Equation (1) below for an example. The economist's marginal approach can handle interaction effects under certain rigid conditions, including the requirement that the revenue function be linear homogeneous (constant returns to scale).

But it is important to recognise that 'even if the revenue function is linear homogeneous, simultaneous allocation by the marginal contributions approach usually will be arbitrary!'⁸ Allocation of the marginal contributions of last units to each of the other units of the same inputs *will* result in total revenue being exactly divided up amongst the various units but where the resources interact in some way this exact allocation of the total revenue will only be a kind of arithmetic coincidence. Thus, strictly speaking, even the existence of constant returns to scale is not enough to guarantee non-arbitrary allocations.

What is needed is a complete absence of interaction effects. This we suggest is unlikely to be encountered in practice.

In the sequel we shall assume *nonhomogeneity* and *nonlinearity* of the firm's revenue function, for where there are fixed inputs in a production process the function must be nonhomogeneous.⁹ Nonlinearity is not essential to our argument, but seems certain to be the case (at least, at the margin).

Consider the following example. Here returns to scale are not assumed to be constant. Suppose that the firm's net revenue function is a nonhomogeneous polynomial of order two of the form¹⁰

$$Y = 3X_1 + X_1X_2 + X_2 \quad (1)$$

with $X_1, X_2 \leq 10$

and where X_1 and X_2 are two different assets employed

in the firm. (In order to simplify the analysis, labour is assumed to yield constant productivity and to be perfectly divisible. Y is therefore net of wage cost. This assumption does not affect the generality of the following analysis; labour could, if wished, be introduced as a specific intangible asset yielding non-constant returns to scale.) The two inputs are used together in the creation of the joint revenue stream Y . If, following Thomas, the firm's net revenue is maximised at £140 by using 10 units of each kind of input, then the revenue for the period is divisible as shown in Table 1.

TABLE 1
Allocation of the Firm's Net Revenue

Separate effect of X_1	= £ 30
Separate effect of X_2	= £ 10
Interaction effect of X_1 and X_2	= £100
Total net revenue of the firm	= £140

There is no non-arbitrary way of allocating the £100 interaction effect to the individual assets X_1 and X_2 . Yet to ignore the interaction effect would result in the undervaluation of X_1 and X_2 .

Now consider how this example would be handled under CCA. The Value to the Business (VB) of an asset can be succinctly summarised as the lower of: (i) the replacement cost of its remaining service potential (RC); (ii) the higher of its net realisable value (NRV) and its discounted present value (PV). In theory at least, estimates are needed of all the three parameters, RC, NRV and PV, for each asset. Assume that the relevant market prices are:

	X_1	X_2
RC	= £250	£200
NRV	= £200	£ 50

In order to abstract from measurement issues, we further assume that the firm's annual net revenue of £140 is constant and certain in perpetuity; that the riskless market rate of interest is constant in all future periods at 10% per period; and that X_1 and X_2 are non-depreciating assets with perpetual lives. Therefore the PV of the firm as a whole is £140/0.10 = £1,400. However what is needed under CCA is the PV of the individual assets; the determination of this is discussed below.

⁶SAR 3, ch. 3.

⁷*Ibid*, p. 46.

⁸*Ibid*, p. 46.

⁹*Ibid*, p. 45.

¹⁰The following example is taken from SAR 3, pp. 38-39, with adaptations. The main change has been to convert the net revenue contributions to discounted present values.

What is meant by the PV of an individual asset under CCA can only be understood if the conditions surrounding the valuation are specified. We shall consider in the remainder of this section three distinct approaches: (i) where only the separate effects are taken into account; (ii) where the whole of the joint effect is assigned to each of the assets in turn; and (iii) where the asset values are first aggregated and then the Value to the Business rule is applied.

1.1 *Separate effects only*

In order to determine how the total PV is to be allocated, the net revenue figures given in Table 1 are each divided by 0.10 (i.e., the formula for calculating the present value of a perpetuity). The result is shown in Table 2.

TABLE 2 Allocation of the Firm's Present Value	
Separate effect of X_1	= £ 300
Separate effect of X_2	= £ 100
Interaction effect of X_1 and X_2	= £1000
Total PV of the firm as a whole	= £1400

Ignoring for a moment the interaction effect, the following valuations are obtained by the Value to the Business rule:

$$X_1 : PV = £300 > RC = £250 > NRV = £200 \\ \text{and so } VB = RC = £250$$

$$X_2 : RC = £200 > PV = £100 > NRV = £50 \\ \text{and so } VB = PV = £100$$

Thus the VB of X_1 is given by RC, implying that if deprived of the asset, the firm would replace the capacity embodied in X_1 ; whereas in the case of X_2 the VB of the asset is given by PV, implying that replacement would not be contemplated. It should not be overlooked, of course, that in reaching these conclusions, the interdependence of X_1 and X_2 has been ignored.

The logic of the VB formula is claimed to be its connection with the opportunity cost concept. The value of the services of an asset already owned by a firm is described by Wright as follows: 'Reversing the well-known concept of opportunity cost, we may

say that their value is equal to the cost, loss or sacrifice which would have to be incurred if the firm did not have those services'.¹¹ Now it is obvious that taking account of only the separate effects and ignoring the interaction effects violates the marginalist principle as enunciated by Wright: if the firm were to be deprived of say X_2 , then the loss suffered would be the separate effect plus the interaction effect. So let us next alter our conception of VB to be consistent with Wright's marginalist rule.

1.2 *Marginal impact of deprivation*

Bringing into account the interaction effect, we obtain the following valuations by the VB rule:

$$X_1 : PV = £300 + £1000 > RC = \\ £250 > NRV = £200 \\ \text{and so } VB = RC = £250 \text{ (as before)}$$

$$X_2 : PV = £100 + £1000 > RC = \\ £200 > NRV = £50 \\ \text{and so } VB = RC = £200 \\ \text{(to be contrasted with } VB = PV = £100 \text{ before)}$$

From a commonsense interpretation of VB, it is more realistic to value both assets at RC. For the total RC of the two assets is £450, which is less than the total PV of the firm of £1,400. In other words, if deprived of *both* assets it would be worthwhile replacing both of them (assuming the absence of complicating constraints such as capital rationing).

However consider what would happen if X_1 and X_2 each had a large RC relative to the other two VB parameters. For example, let us now assume that the RC of each is £1,000. We now have:

$$X_1 : PV = £1300 > RC = \\ £1000 > NRV = £200 \\ \text{giving } VB = RC = £1000$$

$$X_2 : PV = £1100 > RC = \\ £1000 > NRV = £50 \\ \text{giving } VB = RC = £1000$$

This results in a total VB balance sheet figure of £2,000, and this is considerably in excess of the firm's total PV of £1,400. 'Over-imputation' such as this has long been recognised as a possibility when

¹¹F. K. Wright, 'Towards a general theory of depreciation', *Journal of Accounting Research*, 1964, reprinted in R. H. Parker and G. C. Harcourt, eds., *Readings in the Concept and Measurement of Income* (Cambridge University Press, 1969), p. 278.

marginalist value principles are applied to *all* the assets of a firm.¹²

Does this difficulty disappear when the VB rule is applied simultaneously to all the assets, i.e. when it is assumed, notionally, that all the assets are lost?

1.3 Simultaneous deprivation

Consider first the situation where X_1 and X_2 have RC equal to £1,000 each. Combining the two assets and applying the VB rule to the resultant collection we have:

$$\begin{aligned} X_1 + X_2 : RC &= £1000 + £1000 > PV = \\ &£1400 > NRV = £200 + £50 \\ \text{and so } VB &= PV = £1,400 \end{aligned}$$

This accords with the view that the maximum loss the firm could suffer is the whole of the PV of its future cash flows. Over-imputation is avoided.

The question remains, though, as to whether this approach faithfully reflects the decision choices open to the firm. The choice is open to the firm to replace *en masse* all its assets, or to sell off all its assets in favour of a different asset configuration; it is also possible for the firm to make marginal alterations to its asset holdings, and this is not allowed for in the above version of the VB rule. For example, were a firm to be left at the balance sheet date with obsolete stock, the 'simultaneous VB rule' would require all the assets, including the obsolete stock, to be shown in aggregate at either RC, NRV or PV, and not some mixture thereof. It would seem more logical to value the obsolete stock at NRV, regardless of the basis of valuation adopted for the remaining assets.

1.4 Allocated interaction effects

One way out of these difficulties is to require the allocation of the interaction effect over the individual assets, X_1 and X_2 . However such an allocation would be wholly arbitrary and lacking any support from economic theory.

There remains the possibility of reporting the interaction effect as a distinct asset on the balance sheet, presumably as an intangible asset or a component of goodwill. This would seem to be consistent with the Committee's views on the desirability of showing goodwill and intangibles at their Value to the Business.¹³ However it should not be overlooked

that the interaction effect cannot be bought or sold separately (i.e., 'hived off' from other assets) in the market; thus $RC = NRV = 0$. Therefore it follows that a literal application of the VB criterion must result in the interaction effect having $VB = 0$. We would be in the situation described in Section 1.1.

Alternatively, a share of the market prices (RC and NRV) of X_1 and X_2 could be assigned to the interaction effect and the VB analysis could proceed as normally. Needless to say, the allocation would be totally arbitrary.

In the more general case where there have been direct, unambiguously identifiable, outlays on intangibles, e.g., with some research and development programmes, it may be possible to determine a replacement cost figure and, in the case of patents, trademarks, and the like, net realisable value. In this case the VB rule could be applied. However it seems unlikely that all, or even the major part, of the interaction effects could so be dealt with.

1.5 Interaction effect as an asset

Now assume that the firm's net revenue function is of the form:

$$Y = -3X_1 + 1.4X_1X_2 + 3X_2 \quad (2)$$

$$\text{with } X_1, X_2 \leq 10$$

As with Equation (1) this revenue function is nonhomogeneous and of order two. Maximising net revenue at £140, as before, the resultant components of net revenue and associated PV are given in Table 3. Calculation of PV was exactly as stated before.

TABLE 3
Allocation of the Firm's Net Revenue and PV

	NET REV	PV
Separate effect of X_1	= -£ 30	-£ 300
Separate effect of X_2	= £ 30	£ 300
Interaction effect of X_1 and X_2	= £140	£1400
Total net revenue/PV of the firm	= £140	£1400

Note that the separate effect of X_1 is negative. By applying the VB rule to the separate effect of X_1 we obtain (market prices being as in the first example):

¹²For a recent statement see W. T. Baxter, *Accounting Values and Inflation* (McGraw-Hill, 1975), pp. 142-143. See also J. C. Bonbright, *The Valuation of Property: A Treatise on the Appraisal of Property for Different Legal Purposes* (The Michie Company, 1965 reprint of 1937 publication), Vol. I, pp. 76-82.

¹³Sandilands Report, *op. cit.*, para. 590.

$$\begin{aligned} X_1 : RC &= £250 > NRV = \\ &£200 > PV = -£300 \\ \text{and so } VB &= NRV = £200 \end{aligned}$$

$$\begin{aligned} X_2 : PV &= £300 > RC = \\ &£200 > NRV = £50 \end{aligned}$$

which gives $VB = RC = £200$, as before

Thus in this example X_1 would be valued at NRV, implying non-replacement in the event of deprival; moreover, as was demonstrated in the previous subsection, the interaction effect would be shown at zero VB, if treated as a separate asset.

Summarising the results of Section 1, it has been shown that when interactions are ignored or treated as a separate 'intangible' asset, there is a danger that the value of the assets viewed as a collective will be understated; when assets are valued on a piecemeal, marginalist basis, the full interaction effect being credited to each asset in turn, there is a danger of over-imputation and consequent overvaluation of the assets. No suggestion as to how this interaction problem can be dealt with in the CCA system has as yet been made in the literature.

2 Portfolio dimension of the CCA interaction problem

A possible objection to the preceding analysis might centre on our assertion that interaction effects are the exception rather than the rule in business. It might be argued that in the observable range of productive arrangements the assumption of additive values implicit in the Sandilands system is a tolerable proximation to reality. Casual empiricism suggests that this argument is false, but this is an empirical issue, the resolution of which is beyond the scope of the present paper. In the present section we shall consider a class of interactions not discussed by Thomas and the omnipresence of which cannot seriously be doubted.

The interaction we shall be concerned with is due to the impact of uncertainty on PV. The effect of uncertainty, it will be recalled, was ignored in Section 1. We shall discuss two of the many possible approaches to uncertainty: (i) a firm-oriented portfolio approach and (ii) a capital asset pricing approach.

2.1 A firm portfolio approach

Assume first that the firm in question owns just one asset; therefore the PV of the firm as a whole is equal to the PV of the asset. Further assume that PV is calculated in terms of 'certainty equivalents' discounted at the constant risk-free market rate of interest r up to an horizon date N . The certainty equivalents are assumed to be calculated in terms of

a mean-variance portfolio framework, such that

$$PV = \sum_{t=1}^N \left[\frac{E(\tilde{Y}_t) - \lambda_t \text{var}(\tilde{Y}_t)}{(1+r)^t} \right] \quad (3)$$

where the certainty equivalent of the t^{th} period's cash flow (given in the numerator of Equation 3) is defined as (i) the mean cash flow, $E(\tilde{Y}_t)$, minus (ii) a risk factor given by the product of the firm's 'price' per unit of risk, λ_t , and the units of risk, given by the variance of that period's cash flow, $\text{var}(\tilde{Y}_t)$. \tilde{Y}_t is the random cash flow for the period, assumed to be statistically independent of other periods' cash flows.

The above model assumes that the firm prefers more certain to less certain cash flows. Note that when $\text{var}(\tilde{Y}_t) = 0$ the risk factor is zero and the cash flows are certain. It is immaterial for our purposes how the price per unit of risk is arrived at: whether it represents the management's risk aversion or that of the owners. The price per unit of risk may vary over time and hence is indexed to the period in question by the subscript t .

Now consider what happens when the firm purchases another asset. In most instances there will be a divergence between the PV of the firm as a whole and the sum of the PVs of the two assets. There will be an interaction effect. This can be shown as follows. First, we define the mean cash flow of the firm, $E(\tilde{Y}_F)$, where the subscript F refers to the firm, as the sum of the mean cash flows of the two assets, i.e. that

$$E(\tilde{Y}_F) = \sum_{j=1}^2 E(\tilde{Y}_{jt})$$

The subscript j indexes the asset to which the cash flows for period t , \tilde{Y}_{jt} , 'belong' (assuming, of course, that interactions between assets of the type discussed in section (1) are not present). However the variance of the total cash flow of the firm in the t^{th} period, $\text{var}(\tilde{Y}_F)$, is *not* just the sum of the variances of the cash flows of the two assets. It is a basic theorem of mathematical probability that the variance of a sum of two random variables with finite variances is¹⁴

$$\text{var}(\tilde{Y}_F) = \sum_{j=1}^2 \text{var}(\tilde{Y}_{jt}) + 2\text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t})$$

where $\text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t})$ is the covariance between the cash flows of the two assets.

The PV of the firm as a whole, given as Equation 3 for a one-asset firm, is as follows for a two-asset firm:

¹⁴W. Feller, *An Introduction to Probability Theory and its Applications* (Wiley, 1968 edn.), Vol. I, p. 230.

$$PV_F^I = \sum_{t=1}^N \left(\frac{\sum_{j=1}^2 E(\tilde{Y}_{jt}) - \lambda_t \left[\sum_{j=1}^2 \text{var}(\tilde{Y}_{jt}) + 2\text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t}) \right]}{(1+r)^t} \right) \quad (4)$$

In order to clarify the analysis, we next assume that the assets are identical and that their cash flows are independent. That is,

$$\left. \begin{aligned} E(\tilde{Y}_{1t}) &= E(\tilde{Y}_{2t}) \\ \text{var}(\tilde{Y}_{1t}) &= \text{var}(\tilde{Y}_{2t}) \\ \text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t}) &= 0 \end{aligned} \right\} t = 1, 2, \dots, N$$

Consequently the PV of the firm as a whole reduces to:

$$PV_F^I = \sum_{t=1}^N \left(\frac{2E(\tilde{Y}_{1t}) - \lambda_t [2\text{var}(\tilde{Y}_{1t})]}{(1+r)^t} \right) = 2PV \quad (5)$$

where PV is the value of the single-asset firm given in Equation 3. In Equation 5 there is no interaction problem and the determination of the VB of the two assets can be made in an unambiguous fashion.

However the assumption of zero covariance is most restrictive. Next assume:

$$\text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t}) \neq 0.$$

In this case Equation (4) can be rewritten as follows:

$$PV_F^II = 2PV - 2 \sum_{t=1}^N \lambda_t \left[\frac{\text{cov}(\tilde{Y}_{1t}, \tilde{Y}_{2t})}{(1+r)^t} \right] \quad (6)$$

$$= 2PV - 2 \sum_{t=1}^N \lambda_t \left[\frac{\rho_{1,2,t} \sigma_{1t} \sigma_{2t}}{(1+r)^t} \right] \quad (6a)$$

where

$\rho_{1,2,t}$ = the correlation between asset 1's cash flows and asset 2's cash flows in period t

σ_{jt} = the standard deviation of the j^{th} cash flows in period t

The second term in Equation 6a constitutes the interaction effect.

The interaction effect¹⁵ identified in Equation 6a is

likely to be present in the vast majority of companies. In most firms it seems likely that

$$0 < \rho_{1,2,t} < +1$$

that is, that the cash flows generated by the assets of a firm will tend to be *positively* correlated with each other. If this is so, then

$$PV_F^II \leq 2PV$$

given that both λ_t and σ_{jt} are defined to be greater than or equal to zero. In this case the interaction effect is a form of 'negative goodwill'. (Recall that all other types of interaction other than the portfolio interactions are ignored in this section.) *In such circumstances there is a real possibility of overimputation if this negative goodwill is ignored in the determination of individual asset values by the VB rule.*

This is illustrated in the following example. Let $E(\tilde{Y}_{jt}) = £70$, $\text{var}(\tilde{Y}_{jt}) = £1600$, $\rho_{1,2,t} = 0.5$, $\lambda_t = 0.025$, $r = 0.10$, $RC_j = £250$ and $NRV_j = £200$ (for all $j = 1, 2$ and $t = 1, \dots, \infty$). By Equation 3 each of the two assets has the following PV (each asset being viewed in isolation and its cash flows having the same constant probability distribution in perpetuity):

$$PV_j = \frac{70 - (0.025)(1600)}{0.10} = £300 \quad (7)$$

In the CCA system each asset would be valued at £250 in the balance sheet, $VB = RC = £250$. However by Equation 6a the value of the firm as a whole is

$$PV_F^II = (2)(300) - \frac{(2)(0.025)(0.50)(40)(40)}{0.10} = £600 - £400 = £200 \quad (8)$$

The negative interaction effect of £400 results in a total value for the firm which is less than that shown in the balance sheet, for the VB of the two assets is $2 \times £250 = £500$. There appears to be no way of dealing with this interaction effect which is non-arbitrary.¹⁶

Of course, risk-averse firms would tend to seek out investments the cash flows of which covary negatively with those of other investments in the firm's portfolio of assets. In this case we might find that

$$-1 < \rho_{1,2,t} < 0$$

¹⁵The interaction effect to which we refer is not, it should be noted, a 'Thomas interaction', but one due to taking a portfolio view of asset valuations. Any Thomas interactions are *additional* to those described here.

¹⁶It would, of course, be profitable to sell one of the assets. But which one? If it were a matter at this moment in time of owning only one asset and deciding whether or not to buy, then it would not be wise to purchase the other asset. However that is not the problem here.

for some assets and time periods at least. (Whether such investment opportunities exist is an empirical issue.) We might find that $PV_F^H > 2PV$. In this situation the interaction effect would be positive. This can be seen in the previous example if we put $\rho_{1,2;t} = -0.20$, say, the rest being kept the same. The value of the individual assets viewed in isolation is unchanged and is given by Equation 7, but the value of the total firm would become

$$PV_F^H = (2)(300) - \frac{(2)(0.025)(-0.2)(40)(40)}{0.10} \\ = £600 + £16 = £616 \quad (8a)$$

Each asset would be shown in the balance sheet at £250 as before, but the value of the firm as a whole now exceeds the balance sheet total. However if $RC_j > £300$ ($j = 1, 2$) then the accounting valuation depends on how the interaction effect is treated. See the analysis contained in Section 1 of this paper for an elaboration of this.

We have demonstrated in this sub-section that whenever uncertainty is present – which is always – there is an interaction effect and, moreover, the interaction effect sometimes will be negative. This interaction introduces serious ambiguities into the workings of the VB rule.

The results of this sub-section would not hold if the Capital Asset Pricing Model were to be used in determining the present value of the firm. This is demonstrated below.

2.2 A capital asset pricing approach

It may be argued by some that the Capital Asset Pricing Model (CAPM) should have been employed to represent the present value of the firm (and its constituent assets). In the usual form of the CAPM, the present value of the firm is two-parametered in analogous fashion to the model presented in this section of the paper, but risk is defined in terms of the covariability of the rates of return on the firm's securities with the rates of return on the securities of other firms, rather than in terms of the variance of the firm's cash flows viewed in isolation. The logic of this stems from the fact that investors are concerned with the variability of the returns from all their investments viewed as a portfolio; it recognises that investors can and do diversify their holdings.

It is a well known result of modern capital market theory that under certain very stringent conditions the equilibrium expected rate of return on security j , $E(\bar{R}_j)$, is given as:

$$E(\bar{R}_j) = r + \theta \text{Cov}(\bar{R}_j, \bar{R}_M) \quad (9)$$

where

r = the riskless (constant) rate of interest, as before

$\text{Cov}(\bar{R}_j, \bar{R}_M)$ = the covariance between the return on security j and returns on the market portfolio of securities

\bar{R}_M = return on the market portfolio

θ = the market premium per unit of risk (a positive constant), defined as $[E(\bar{R}_M) - r]/\text{var}(\bar{R}_M)$.

A single-period model of this general type is standard in the literature¹⁷ and is sufficient for our purposes; hence time subscripts have been dropped from the variables. (The market price of risk may change from period to period, but this does not alter the essential character of the model.)¹⁸

One important modification needs to be made to Equation 9 before we can proceed further. We need to be able to express the model in terms of the *cash flows of the firm* rather than in terms of *rates of return on the firm's securities*. Stapleton has derived a fully integrated capital-budgeting and security-valuation system in which share value is presumed to depend upon the firm's expected earnings stream and the expected riskiness of that stream.¹⁹ Making use of this (theoretical) integration of capital-budgeting and security-valuation²⁰ in a single-period context the total end-of-period cash flow of the firm is the cash flow during the period plus the present value at the end of the period of future cash flows; this is presumed to be equal to the cash flow realisable by the shareholders during the period.

Equation 9 now can be rewritten such that the j^{th} firm's share value is expressed in terms of end-of-period cash flows. The derivation is as follows.

¹⁷See J. C. Francis and S. H. Archer, *Portfolio Analysis* (Prentice-Hall, 1971), pp. 134-143 for details of the derivation of this model.

¹⁸For an example of a multi-period analogue of the single-period model, see M. J. Brennan, 'An Approach to the Valuation of Uncertain Income Streams', *Journal of Finance*, June 1973. Brennan shows that the essential feature of the single-model is preserved in the multi-period model: a security's excess return over the riskless rate for a given (future) period is proportional to its weighted average instantaneous rate of covariance with the market return for the same period. For an earlier proof that single-period maximisation results in investment choices indistinguishable from multi-period maximisation, see E. Fama, 'Multi-period Consumption – Investment Decisions', *American Economic Review*, March 1970.

¹⁹R. C. Stapleton, 'Portfolio Analysis, Stock Valuation and Capital Budgeting Decision Rules for Risky Projects', *Journal of Finance*, March 1971.

²⁰Such an integration depends crucially upon a 'meeting of minds' (common expectations) of managers and investors. For a critique of this assumption, see P. S. Albin, 'Information Exchange in Security Markets and the Assumption of "Homogeneous Beliefs"', *Journal of Finance*, September 1974.

Denote by \bar{X}_j the (random) total end-of-period cash flow realisable by the shareholders of firm j , and by \bar{X}_M the (random) total cash flows obtainable at the end of the period from all firms by all investors (i.e. the realisation of the market portfolio). Both \bar{X}_j and \bar{X}_M are as seen at the beginning of the period. These can be rewritten as $\bar{X}_j = (1 + \bar{R}_j) PV_j$ and $\bar{X}_M = (1 + \bar{R}_M) PV_M$. As PV_j and PV_M are scalars, it follows that $\text{var}(\bar{X}_j) = (PV_j)^2 \text{var}(\bar{R}_j)$; that $\text{var}(\bar{X}_M) = (PV_M)^2 \text{var}(\bar{R}_M)$; and that $\text{cov}(\bar{X}_j, \bar{X}_M) = PV_j PV_M \text{cov}(\bar{R}_j, \bar{R}_M)$.

Adding 1 to both sides of Equation 9, multiplying the result by PV_j , and collecting terms yields:

$$PV_j = \frac{PV_j[1 + E(\bar{R}_j)] - \theta \text{Cov}(\bar{R}_j, \bar{R}_M) PV_j}{1 + r} \quad (10)$$

Note that $PV_j [1 + E(\bar{R}_j)] = E(\bar{X}_j)$. Finally, substituting for $\text{Cov}(\bar{R}_j, \bar{R}_M)$ and putting $\lambda = \theta/PV_M$ yields:

$$PV_j = \frac{E(\bar{X}_j) - \lambda \text{Cov}(\bar{X}_j, \bar{X}_M)}{1 + r} \quad (11)$$

where λ is the market premium per unit of risk, now expressed in terms of cash flows, and defined as $[E(\bar{X}_M) - PV_M(1 + r)]/\text{var}(\bar{X}_M)$.

It should not be overlooked that the definition of 'cash flows' in Equation 11 is at variance with the definition used in section 1. Here the stream of (random) cash flows through time is captured in two parts: (i) the cash flow during the period and (ii) the present value at the end of the period, as seen at the beginning of the period, of the cash flows in subsequent periods. The end-of-period present value is calculated in similar fashion. Thus in the spirit of dynamic programming, the portfolio model (11) is applied to the final period, to arrive at the present value at $N-1$. (11) is applied again in the preceding period, incorporating the present value at $N-1$, to obtain a value at $N-2$. This backward induction procedure continues down to the current period. For the current period, the resultant two parts are summed to form \bar{X}_j and \bar{X}_M , respectively.²¹

The next step in our analysis is to assume (for convenience) that each firm owns but a single asset. A new firm created by the merger of the i^{th} and j^{th} firms, say, would consist of two assets. It is a basic proposition of capital market theory that, in the absence of interaction effects of the kind discussed in section (1) of this paper, the share value of the new

firm should be equal to the sum of the share values of the two distinct firms, i.e.

$$PV_{i+j} = PV_i + PV_j \quad (12)$$

This should be so regardless of the presence of covariation between the cash flows of the two firms.

The reason is as follows. The expected value of the combined cash flow is the sum of the expected values of the individual firms' cash flows:

$$E(\bar{X}_{i+j}) = E(\bar{X}_i) + E(\bar{X}_j) \quad (13)$$

The market premium per unit of risk is unchanged and is given as λ . It therefore follows that for Equation 12 to be true, then the covariance of the new firm's cash flows with the market's must equal the sum of the separate covariances of each of the two individual firms' cash flows with the market's, i.e. that

$$\begin{aligned} \text{Cov}(\bar{X}_i + \bar{X}_j, \bar{X}_M) &= \\ \text{Cov}(\bar{X}_i, \bar{X}_M) + \text{Cov}(\bar{X}_j, \bar{X}_M). \end{aligned} \quad (14)$$

Mathematically speaking, this is the case. Thus, using the CAPM, it can be seen that (in the absence of Thomas-type interaction effects) the present value of a firm should be capable of being unambiguously allocated over the assets it owns.

The uncertainty of the cash flows generated by each asset would be defined in terms of the extent to which it is anticipated that they will covary with those of other firms. Therefore use of the CAPM would avoid the difficulties encountered when risk is defined in terms of the variability of the cash flows of the firm itself.

However we query whether in fact the CAPM is a suitable present value concept for accounting valuation purposes. First, CCA is intended to apply to all sorts of business enterprises and not just to listed companies (for which the CAPM is designed). Private companies and state-owned corporations, for example, could not make much use of the CAPM (conceptual use, that is; we are not envisaging that firms would actually compute PV with it).

Secondly, the CAPM disregards the personal interests of the management in the company itself and views their function as being merely that of furthering the interests of investors with diversified portfolios. Under CCA, the management will be responsible for estimating the PV of the firm's assets; it is unlikely that they will adopt as a definition of risk the extent to which the firm's cash flows covary with the cash flows of other firms. More likely, risk will be viewed in terms of the variability of the cash flows of the firm itself, possibly something like the way we defined it in the first part of this section.

²¹Bogue and Roll have derived a method for discounting an uncertain income stream in this manner. See M. Bogue and R. Roll, 'Capital Budgeting of Risky Projects with "Imperfect" Markets for Physical Capital', *Journal of Finance*, May 1974.

There are other difficulties with the CAPM, the discussion of which involves issues going far beyond the scope of this paper. Basically, they stem from the fact that the CAPM provides an equilibrium value for the firm; yet in equilibrium there is no demand for accounting reports.²²

For these reasons we are of the view that the firm-specific model (Equation 3) is the most relevant. However, it must be recognised that the 'portfolio effects' identified with that model would not be present if PV were defined in terms of the CAPM.²³

3 Summary and conclusions

We have shown in this paper by means of a form of analysis developed by Professor Arthur Thomas that the valuation of a firm's assets under CCA is, to a certain extent, indeterminate. It was further shown that even in the absence of 'Thomas effects', there are interactions arising from the presence of uncertainty which can cause CCA valuations to be arbitrary/indeterminate. (Note, though, that these uncertainty interactions disappear if the Capital Asset Pricing Model is employed in valuing the assets.) It is too much to expect that, where both effects are present, the 'Thomas effects' will exactly cancel out the 'portfolio effects'; sometimes they will be in the same direction, as we have shown.

These difficulties with CCA apply to both depreciating assets and to non-depreciating assets.²⁴ It was assumed throughout the paper that a defensible measure of net-of-depreciation replacement cost is somehow possible. However, Thomas has shown that this is not the case, except on rare occasions. In the light of this, it is obvious that there is much that needs to be done before CCA can be considered to be a theoretically satisfactory accounting model.

Nevertheless, it should not be assumed that CCA is completely subjective in the way that a discounted present value system is. The PV of an asset can

range from zero to infinity;²⁵ but this is not the case with VB. The VB of an asset must be either its (depreciated) replacement cost or its net realizable value, or somewhere in between. Thus CCA provides a system of constrained values; though we have seen that the constraints can be drawn very widely indeed.

It may be argued by some that the indeterminacies concerning the VB rule identified in this paper, coupled with Thomas' criticisms of depreciation allocations, constitute a strong case against CCA. We do not share this view. Its shortcomings notwithstanding, the CCA system seems to us to have many merits. CCA is, at the individual asset (rather than total firm) level, a *valuation* system and, moreover, one which generates market-validated measurements of financial position and performance. And in this context it is worth recalling the observation in the previous paragraph that CCA provides measures of value *within* the range set by the difference between (depreciated) replacement cost and net realisable value. There is an urgent need, though, for some constraints to be set on freedom which exists under CCA to select a preferred valuation within the RC - NRV spread.²⁶

The main point of this paper concerns the failure in the Sandilands Report to recognise that intangibles and goodwill cannot be dealt with as an afterthought. Unlike under the extant historical cost system, intangibles and goodwill under CCA are caught up in the set of VB rules put forward for valuing the tangible assets. Unless some proximate criteria which can to a large extent eliminate the role of PV in the valuation process are substituted for the Committee's VB rules,²⁷ accountants will constantly be required to make difficult allocation decisions regarding what we have called 'interactions'. What is more, these allocations will be *in addition* to the inter-temporal allocations already required in determining depreciation (also an essential input into the VB valuation procedure). What is needed is a major and urgent programme of research into the accounting treatment of interactions such as goodwill and intangibles.

²²For a more technical critique of the utility of the CAPM in financial accounting see K. V. Peasnell, 'A Note on the Discounted Present Value Concept', *Accounting Review*, January 1977 and 'The Present Value Concept in Financial Reporting', *Journal of Business Finance and Accounting*, Summer 1977.

²³It should be noted that the two two-asset models used in this section, as given in Eqs. 4, 6a and 11, can each be generalised to deal with M assets ($M > 2$) without altering the arguments.

²⁴The difficulties with CCA discussed in this paper are caused by the central role given to PV in the determination of VB. For a modification of the VB rule which minimises the role of PV, see K. P. Gee and K. V. Peasnell, 'A Pragmatic Defence of Replacement Cost', *Accounting and Business Research*, Autumn 1976.

²⁵Strictly speaking, the PV of an asset can be negative, as we have seen above. However, as an empirical (as opposed to logical) matter, there is likely to be some floor not greatly below zero under which the PV of an asset is unlikely to sink, whereas the important point is that the PV of the firm as a whole has an almost limitless height which it could (in someone's imagination) soar to.

²⁶It should not be overlooked that managements do not have unfettered discretion under the VB rules: when $RC < NRV$ then $VB = RC$ regardless of the estimate made of the asset's PV. Discretion only exists when $RC > NRV$.

²⁷For an example of such criteria see Gee and Peasnell, *op. cit.*

It would not be surprising, of course, if the needed breakthroughs in the development of logically satisfactory accounting treatments of goodwill and intangibles, and depreciation, are not achieved; that these interactions turn out to be 'incurable', as Thomas puts it.²⁸ In that case the profession would or should then face up squarely to the problem: either abandoning altogether the attempt to measure profit in favour of cash-flow accounting, say, or continuing to measure (CCA) profit and individual asset 'values', but reporting them as (somewhat unreliable) supplementary statements to the cash-flow statement.

We venture to suggest, though, that this kind of prescription would be resisted by the business

community and accounting profession as premature; the things which CCA attempts to do (and cash-flow accounting does not) – provide articulated measures of financial position and progress, matching of costs and sales, etc. – are what users of financial statements seem to want. However the central message of Thomas' various writings and this paper is that accountants cannot at present deliver the goods. More research is needed to see whether or not asset valuation and profit measurement can be given the sound basis they now so patently lack.

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²⁸A. L. Thomas, 'The FASB and the Allocation Fallacy' *Journal of Accountancy*, November 1975.

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Value Accounting for Currency Transactions

Michael Earl and Dean Paxson

As exchange rates fluctuate, foreign currency receivables and payables become problematic and potentially deceptive items in the sterling ledgers of an international trading operation based in the UK. With the spot currency price of sterling often changing several percentage points between the invoice and settlement dates, and with the forward rate of currencies against sterling at variable premiums or discounts, recording revenues or costs occurring in foreign currencies on the basis of the initial spot exchange rates may be significantly misleading. Not only are doubtful exchange gains and losses introduced into the financial accounts, but management accounts can become distorted, consequently harming management decision and control.

Value accounting for currency transactions overcomes many of these problems. This involves incorporating both the exchange rate and the value of money into the accounting system. Such a system records, and periodically restates, currency transactions at present values, that is the current value in current money to the firm of future cash receipts and payments. 'Currency transactions' may include any items which are expected to be converted, or convertible, from foreign currency to sterling in the future. As a simplification for this paper, we consider primarily export receivables (invoices) denominated in the major convertible foreign currencies. However the same type of accounting specifications are appropriate for import payables and for interest-bearing deposits and loans.

The prime objective of value accounting for currency transactions is to create 'currency awareness' in the firm; that is, by recording and demonstrating the real impact of exchange rate fluctuations, to help and encourage management to cope with the uncertainty of floating currencies with more realism and understanding. Value accounting helps management judge the relevance of realised and unrealised exchange gains and losses, and assess the other layers of controllable and uncontrollable exposure to currency fluctuations.

Value accounting employs forward rates for translating currency transactions. For firms which

systematically limit their speculation on future exchange rates, and for some companies with centralised currency management, currency items should be recorded at transaction date using forward rates, with minor adjustments on the date of settlement. Use of forward rates improves management decision and control. Forward rates also provide a fair inter-company transfer price which aids performance evaluation of both divisional export marketing and import purchasing, and of centralised currency management.

The procedures proposed constitute a comprehensive accounting system for currency transactions. In practice, companies will need to examine the costs of full system operation against the likely benefits. The need to allow for the time value and exchange risks or opportunities of currency transactions will depend on the amounts involved, the length of time-periods, the rates of interest and the magnitude of forward exchange premiums or discounts. Clearly this need will vary from firm to firm and over time.

The accounting impact of currency fluctuations

In an accrual accounting system, revenues are calculated on the basis of the nominal sterling amount of invoices sent out during the accounting period, usually at the dates coinciding with the shipment of goods ('transaction date'). There are various exchange rates which might be used to record a foreign currency invoice in a sterling sales or purchase ledger. Many companies simply set a rate at the beginning of each month, to be used during that month, based on the spot exchange rate at the end of the previous month, or on the average spot exchange in the previous month. These rates may be taken from the inter-bank rates in the financial press, or alternatively, may be based on the actual buying and selling currency rates quoted to firms by UK authorised banks. If the indicated exchange quotation is \$1.7000 - 1.7010, the former is the buying rate for currency used to enter currency payables in a sterling ledger, and \$1.7010 is the selling rate for foreign currency against sterling used to enter currency receivables in

a sterling ledger. As a simplification, the mid-point exchange rate (\$1.7005 in this example) is often used as the sterling basis for all currency receivables and payables during the month.

When daily currency fluctuations are significant, some firms may use as the recording rate the quotation prevailing immediately prior to entering items in the daily sales ledger. This practice appears to be recommended by the US Financial Accounting Standards Board in its Statement of Financial Accounting Standards No. 8 (FASB 8): 'Foreign Currency Transaction. The applicable rate at which a particular transaction could be settled at the transaction date shall be used to translate and record the transaction.'¹ However, the spot rate on the transaction date is unlikely to be the rate prevailing at the invoice settlement date, that is when currency is received on settlement of a receivable, or when sterling is converted by the firm into currency for the settlement of a payable.

Other companies attempt to approximate the eventual settlement rate through using an 'expected rate' based on an external or head office forecast rate, or on the forward exchange rate, for one month, or for whatever the average number of months are expected to elapse between the transaction date and the settlement date, for all receivables, or for all payables, or for all currency transactions. Such recording rates may be set at the beginning of each month, or adjusted occasionally during the month.

Exchange Gains and Losses

Realised exchange gains or losses arise when a foreign currency is received or paid on settlement date at a rate different from the recording rate. Since any receivables or payables in foreign currency will contribute to sales revenue and cost of sales figures used in profit reporting, it is important that exchange gains and losses are accurately computed and clearly disclosed.

In management accounts, such exchange gains and losses may be based on the difference between settlement spot rates (deducting bank commissions and collection or transmission charges) and outdated or inappropriate recording exchange rates. In some companies those exchange gains or losses may be (a) simply ignored as items over which management has no control, or little ability to anticipate, and entered into the management accounts as extraordinary or residual items, or (b) retrospectively

applied to adjust the original sales or purchase ledgers. In ignoring or 'correcting' for exchange gains or losses, it is likely that some important uses of management accounts will be impaired or disregarded.

For example one dysfunctional consequence could be in standard costing systems. Actual costs and revenues are generally translated from foreign currencies into sterling and compared with standard values which were based on some 'standard' exchange rate. The variance between the actual and standard exchange rates, however determined, is the 'exchange rate variance', although this might be subsumed in the price variance. This exchange variance represents the difference between the expected sterling price per unit and that actually received or paid on settlement. Typically such a variance is calculated initially in the transaction month and may thus be inaccurate, or is subsequently recalculated in the settlement month when the variance is no longer timely.

Thus in those companies which base decisions on exchange gains/losses information, or on exchange rate variances, management may be misled if the gain or loss is calculated on an original recording exchange rate which is inappropriate or arbitrary.

Objectives of Currency Accounting

Although exchange rate speculation may not be the function of multinational managers, anticipation of exchange gains and losses – 'currency awareness' – is a management responsibility. Such anticipation or awareness might lead to more sensitive pricing, more astute credit policies, invoicing in strong currencies, reappraisal of product and market mixes and creation of exchange gains through the forward exchange market.

Clearly the movement of exchange rates is beyond the control of the firm; but through currency management there is the opportunity of using the forward exchange market for insurance by hedging the net exposure of currency receivables and payables, or of speculation by hedging only one or the other. Conversely a policy not to hedge should be a conscious decision of management with the appreciation that it involves a degree of currency speculation.

From this currency context, the objectives of currency accounting can be derived. An adequate management information system for recording currency transactions and for calculating subsequent exchange gains and losses should meet the following criteria:

- (1) Monthly management accounts should be realistic and accurate, and be as representative as possible of future cash flows, subject to accrual conventions.

¹Financial Accounting Standards Board, *Statement of Financial Accounting Standards No. 8, 'Accounting for the Translation of Foreign Currency Transactions and Foreign Currency Financial Statements'*, Stamford, Connecticut, October 1975, pp. 6-12.

(2) Financial control systems, such as standard costing, should be able to provide meaningful variance analysis and control information on exchange rate movements.

(3) Financial control systems, such as profit planning and reporting, should assign exchange gains and losses to controllable responsibility centres or divisions and to currency management centres.

(4) The exchange accounting procedures should avoid complex calculations, or at least the system should be flexible enough to match particular needs.

We have seen that for recording currency transactions, the use of the spot rate as of the transaction date to translate currency receivables ignores any exchange risk at the transaction date because it may not be equal to the eventual settlement rate. Using an average spot rate is not realistic, especially under exchange rate instability, and produces meaningless gains and variances. An expected settlement spot rate, if feasible, is not likely to be objective and will create interim gains and variances which may reflect inconsistent and biased judgements.

Instead we propose that the recording rate should be the *forward exchange rate* obtained (or obtainable) for each settlement date of a currency receivable/payable as of the transaction date. This meets most of the above objectives – especially when the firm avoids speculating in foreign currencies by hedging via the forward currency market. In particular, use of the forward rate:

- (1) Is objective in the sense that it is an available market rate. It is also accurate in the sense that the firm can establish a *guaranteed* exchange rate gain on a 'strong' currency receivable because the forward rate is the settlement rate, if the foreign currency is sold forward against sterling for the same maturity date, currency and amount of the receivable (which coincides in most cases with UK Exchange Control requirements for forward transactions by non-bank residents).
- (2) Allows meaningful and timely variance analysis because the likely actual currency receivable and payable can be compared against budget or standard in the transaction period.
- (3) Allows the currency manager's performance to be measured, since his decision to hedge or not can be evaluated at settlement date by comparing the eventual cash flow against what was available if he had hedged at the transaction date. At the same time responsibility centres can be 'credited' with fair operating revenues/costs at transaction date.
- (4) Can be reconciled at year-end. This is achieved

by adjustment, through journal entries, of the accrued receivables and payables at year-end spot rates, plus or minus the appropriate currency item cash flows actually received and paid over the year, plus or minus the gains/losses due to the revaluation of outstanding forward exchange contracts at the year-end forward rates applicable to the unexpired portion of the contracts. Alternatively, subsequent restatements or revaluations at year-end would be ignored for those currency items for which eventual settlement rates have been irrevocably fixed through forward exchange transactions.

The procedure for recording and using forward exchange rates must now be specified.

Exchange rate recording procedures

The dynamics of a foreign currency recording procedure on transaction dates, settlement dates and year-end are illustrated below for export receivables. Subscripts (t , $t \pm y$, $t \pm z$ or $t \pm i$) refer to action dates, and superscripts (i) refer to future days ahead. Except for the actual settlement, all the other exchange rates specified are the estimated market rates for the day – in practice generally the closing market rate on the previous day.

- Stage 1 original sales price is set in currency, based on the standard sterling price multiplied by the standard spot rate ('S') of units foreign currency per pound (e.g. dollars per pound)
- Stage 2 order confirmed at agreed price when spot rate is S_{t-y} , 'y' being the days between confirmation and invoice date (t).
- Stage 3 invoice at currency price and record nominal invoice at currency amount ('FC') divided by spot exchange rate at invoice date: thus nominal record in sterling is FC/S_t .
- Stage 4 restate, and enter in sales ledger at invoice date t , the invoice amount at currency price divided by the available forward rate 'F' for the expected settlement date, 'i' days ahead: thus ledger entry is FC/F_t^i .
- Stage 5 on entering into a forward contract at time $t + z$ ('z' days after invoice date), restate the invoice amount at currency price divided by the then available forward rate F_{t+z}^{i-z} for the settlement date. If the firm wants to calculate the best opportunity forward rate which is available over the life of the currency receivable, F_{t+z}^{i-z} could be entered into the system each day after the order confirmation through to settlement date.
- Stage 6 both at the forward exchange contract date and at the settlement date, there may be bank costs B_t or B_{t+i} (in addition to the

effective currency rate spreads), which are collection or transmission charges for the foreign currency and commissions on the forward contract or the spot conversion.

- Stage 7 at month-, quarter-, or year-end, any revaluations of currency transactions should be effected at S_e , the closing spot rate at the end of the period; or at the same exchange rate at which revaluations of any outstanding forward contracts are made, that is F_e^{i-k} , 'k' being the number of days unexpired at the end of the period in an 'i' days forward contract entered into at 't'.
- Stage 8 calculate at the settlement date the sterling invoice amount for unhedged currency items, namely the currency amount divided by the then spot rate, S_{t+i} ; the hedged currency items are settled at the forward rate F_t^i
- Stage 9 the system provides for the entering of other rates such as I_t^i , the interest rate as of the invoice date for a maturity extending to the settlement date and conceivably the 'opportunity' interest rate thereafter, together with any appropriate price index at either sales confirmation date (if the price is fixed) or otherwise at invoice date, and then at settlement date.

Currency Awareness Accounts

From this specification of the data entry system, various decision and control accounts, or information, can be identified:

- (1) The amount entered in sales and claims ledger = FC/F_t^i if hedged on transaction date, or FC/S_t if unhedged, with an adjustment of $FC/F_{t+z}^{i-z} - FC/S_t$ if hedged after transaction date;
- (2) The benefit/cost of invoicing in currency = $FC/F_t^i - FC/S_t$ or $FC/S_{t+i} - FC/S_t$; if S_t is considered appropriate for the alternative benefit/cost of invoicing in sterling;
- (3) The currency management gain/loss is computed according to the decision possibilities, namely:

$FC/F_t^i - FC/F_{t+z}^{i-z}$ where hedging timing is flexible, reflecting delayed forward covering, or the opportunity to hedge at more advantageous rates subsequent to the transaction date.
 or $FC/F_t^i - FC/S_{t+i}$ where not hedging is possible.
 or $FC/F_t^i - FC/f_t^i$ where f_t^i is the actual

forward rate obtained, in contrast to average or quoted forward rates.

- (4) Settlement adjustments to the profit and loss account should, if hedged, be $- [B_t + B_{t+i}]$ where bank charges are notified upon settlement, or $FC/S_{t+i} - FC/S_t - [B_t + B_{t+i}]$ if unhedged.
- (5) Month-, quarter-, year-end restatements are necessary only for unhedged items namely: $FC/S_t - FC/S_e$ or $FC/S_t - FC/F_e$ since the gain/loss on revaluing items hedged at the appropriate transaction date will generally cancel out the loss/gain on revaluing the associated forward contracts.

This recording system is simple for firms which do not speculate on currency claims/commitments and which receive/pay currencies at known settlement dates. Only an initial entry FC/F_t^i and subsequent adjustment for bank charges are required - unless additional information is desired, such as cost-benefit analysis of currency invoicing, of hedging or of discretionary currency management. However for firms who speculate, or whose settlement dates are particularly unpredictable, or who seek more comprehensive currency management information, the calculations become more complex.

Currency Exposure Accounting

The complexity and uncertainty of currency dynamics demand a specialised accounts data-processing system. UK firms should maintain a currency claims/commitments book based on Stage 3 entries. Those firms who can forecast claims from sales order confirmation, or commitments from the purchase order-book, may enter items before Stage 3. From the anticipated currency exposure evident in the claims/commitment book, any required matching or forward exchange activities can be planned in advance. A supporting ledger or memorandum should also be maintained, showing the amounts covered forward, and separately as a cross-check the amounts of unexpired forward contracts. The claims/commitments book and forward exchange ledger form both the currency management and the currency accounting master files.

Rather than copious translating and revaluing of individual currency transactions, some firms (and banks) find it easier to maintain sales and purchase (or loan and deposit) ledgers in certain major currencies, thereby creating nominal currency pools. The aggregate receivables and payables in each currency categorised by maturity are then recorded, revalued and adjusted as though they were individual currency transactions.

If a currency claim or commitment is hedged, no restatement subsequent to transaction date is required – other than for bank charges – since the settlement rate is fixed in the forward contract (barring defaults by the counter-party bank). The exchange gain or loss is thus certain. In the UK, forward contracts may be taken out by non-banks only to hedge firm contractual commitments, and must be held until the forward maturity date. Should the underlying currency item be paid or received on a date other than the original settlement date, the forward contract must be closed out or extended in which case there may be an unexpected gain or loss. In the UK, two primary mechanisms for dealing with such timing uncertainty (primarily on currency receipts) are available:

- (1) optional time forward contracts where the firm has the option of delivering currency against sterling, or sterling for currency, at any time within a pre-set time period, such as between two and three months from the date of the forward contract;
- (2) with permission of the Bank of England under certain conditions, a firm may establish a currency bank account into which specific currency receipts may be paid, and out of which payments in the same currency may be made.

Optional time forward contracts present no problem for management accounting. The settlement rate is fixed in the contract and the underlying currency items should be restated in terms of that rate immediately the optional forward is taken out as a specific hedging contract.

The currency bank account however is usually a variable currency exposure account; excess amounts over a stated limit in one month are converted into sterling the next month. Thus claims/commitments might be recorded at spot rates if they are expected to go into the currency bank account, except for the expected excess, which if directly or indirectly hedged might then be recorded at the forward rate for the forward contract (and expected conversion) date. The currency bank account itself should be revalued at the end of the month at the then spot rate, with any gain or loss taken into the income statement as an exchange rate adjustment, for even though the gain or loss is not realised, it is immediately realisable by conversion of the currency into sterling at any time.

Finally, firms may attempt to match the exposure of claims against commitments in the same currency, with the net claims or net commitments in currency constituting the amount which is hedged in whole or in part on the forward market. Seldom will the scheduled settlement dates of receivables and pay-

ables coincide, although the time of payables may be controlled by management insofar as (if any cash discount is not taken) the payable might be settled at any date prior to the practical due date, to coincide with receipt of currency. Since forward rates are not likely to vary substantially among maturities as close as one to two weeks, that is, say, between $i = 60$ and 70 days, it would seem prudent to record strong currency receivables, which are matched internally against the same currency payables, at the forward rate for the earliest expected date of settlement, and then make adjustment in the period of settlement for any shortfalls or surpluses.

It may seem that there are numerous adjustments that may have to be made arising out of settlement timing differences on closing out or extending forward contracts, or in connection with currency bank accounts, or in matching currency claims/commitments. However each such settlement problem should be notified by the authorised bank to the firm, and it would seem appropriate to collate small differences as adjustment items, without defeating the overall objective of incorporating currency awareness directly into management accounts.

Recent accounting standards and studies

FASB 8 noted that a forward rate recording system was an alternative to the recommended method of using spot rate recording on transaction dates:

An alternative approach for a forward contract intended to hedge a specific foreign currency transaction for the period between transaction date and settlement date is to use the rate in the forward contract rather than the spot rate at the transaction date to establish the related amounts payable or receivable. (p. 90)

Because in the USA 'specific identification of individual forward contracts with related unsettled foreign currency transactions may not be readily ascertainable' (p. 90) the Board concluded that 'a more practical approach' is to record transactions at the spot exchange rate, restating receivables/payables at the spot exchange rate prevailing at a subsequent balance sheet date, and at that date revaluing any unexpired forward contract intended to be a hedge of a foreign currency exposed net asset position or exposed net liability position. Both revaluation gains and losses are included as income for the period in which the rate changes. The end-period gain or loss on such a forward contract:

shall be determined by multiplying the foreign currency amount of the forward contract by the

difference between the spot rate at the balance sheet date and the spot rate at the date of inception of the contract (or the spot rate last used to measure a gain or loss on that contract for an earlier period). The discount or premium on the forward contract (that is, the foreign currency amount of the contract multiplied by the difference between the contracted forward rate and the spot rate at the date of inception of the contract) shall be accounted for separately from the gain or loss on the contract and shall be included in determining net income over the life of the forward contract (p. 10).

Thus for an outstanding strong currency export receivable, the currency of which is sold forward against the home currency at the then transaction date for the expected receivable settlement date, if revenue is recorded at the initial spot rate, then at balance sheet date there is likely to be a gain on the restatement of the receivable at the then spot rate, and a loss on the revaluation of the forward contract. In addition, there will be a gain on the proportion of the forward premium that has expired by balance sheet date, or $(S_t - F_t) \left(\frac{t-k}{t}\right)$. This recommended accrual of the forward premium/discount over the life of the contract seems to be based on the belief that 'the original discount or premium on a forward contract normally reflects an interest rate differential between two countries which should be recognised over the life of the [hedging] contract' (p.90). But the FASB has not recommended accruing an attributable interest factor to domestic receivables or payables over the life of the credit, except for certain notes extending over one year.² Regardless of the determinants of forward exchange rates, a hedging forward contract fixes the settlement rate. Providing forward contracts are specifically identified with underlying commercial transactions, as is required in most countries with exchange controls such as the UK, Denmark and France, it may be more practical and simpler to record hedged transactions at the forward rate without requiring subsequent restatements at balance sheet dates.

In FASB 8, the one area of business activity in which some forward exchange gains/losses are directly included in original transactions, is for a

forward contract which hedges a commitment in foreign currency (that is, an expected future foreign currency transaction such as a sales or purchase order in currency). The forward contracts which are considered a hedge of an identifiable foreign currency commitment are those under which

- (a) The life of the forward contract extends from the foreign currency commitment date to the anticipated transaction date or a later date.
- (b) The forward contract is denominated in the same currency as the foreign currency commitment and for an amount that is the same or less than the amount of the foreign currency commitment.
- (c) The foreign currency commitment is firm and uncancellable. (p. 11)

The gain or loss is deferred on such forward contracts covering commitments with transaction dates after the balance sheet date.

For a forward contract which hedges a commitment with a transaction date prior to the balance sheet date, two types of gains or losses may be included in the 'measure of the dollar basis of the related foreign currency transaction when recorded' (p. 19): (1) a gain or loss which is determined by multiplying the foreign currency amount of the forward contract by the difference between the spot rate at the transaction date and the spot rate at the inception of the contract; (2) the forward contract's discount or premium that relates to the commitment period. The forward gain or loss prior to the transaction date is deferred until it is included in the dollar basis of the related currency transaction, so that the gain/loss is indirectly recognised at the transaction date.

Thus FASB 8 deals with some of the inadequacies of conventional accounting, without extending the solution to a more comprehensive system for recording currency transactions at expected firm settlement rates. The gains/losses on forward exchange contracts are not required to be disclosed as a separate exchange gain or loss item; nor are the amounts of outstanding forward contracts at the balance sheet date.

P 35410

Exposure Draft 21

In ED 21, 'Accounting for foreign currency transactions', the Accounting Standards Committee recommends that the closing rate be used for translations of currency receivables and payables at the balance sheet date. However 'where forward exchange contracts have been arranged in respect of debtors and creditors the contract rate of exchange is used instead of the closing rate'.³ It does not specify nor

²Financial Accounting Standards Board, 'APB Opinion No. 21', in *Financial Accounting Standards*, Commerce Clearing House, Inc., Chicago 1975, p. 305. In accounting for certain receivables and payables exceeding one year, 'the difference between the present value and the face amount should be treated as discount or premium and amortized as interest expense or income over the life of the note in such a way as to result in a constant rate of interest when applied to the amount outstanding at the beginning of any given period.' Disclosure is required of the face amount of such notes and unamortized discount and the imputed interest rate.

³Accounting Standards Committee, *Exposure Draft 21*, 'Accounting for Foreign Currency Transactions', London, 29 September 1977.

forbid the use of forward rates for initial recording. It is ambiguous as to where the exchange gains/losses resulting from the difference between the initial recording rate and the forward rate would appear. Conversions of currency under the closing rate method are to be included in the ordinary profit and loss account, but translation differences on current items at balance sheet date are to be included below the ordinary profit line in the category 'Exchange gain/(loss)'.⁴ Thus ED 21 allows the currency manager some flexibility in determining profits for a particular period.

For example, suppose there were foreign currency creditors payable within ninety days extending over the year-end, in a currency which sells at a forward premium against sterling and which had appreciated against sterling from the initial recording date. Under ED 21, earnings per share would be decreased if the creditor were paid by the year-end, and, it could be argued, should be decreased if covered forward either initially or by the year-end. Otherwise any translation gain/loss of that creditor amount by the year-end would not affect earnings per share for that year.

Exposure Draft 18

The Inflation Accounting Steering Group recommended in Exposure Draft 18 that 'the value to the business of assets and liabilities which are located overseas or denominated in an overseas currency should be ascertained in the countries concerned in accordance with the provisions of this Standard and translated into sterling using the rate of exchange at the date of the balance sheet. Translation differences arising from exchange rate movements should be treated as surpluses or deficits arising on revaluation'.⁴ In the guidance manual, it was stated that 'receipts and payments in foreign currencies (e.g. the receipt of dividends) will be recorded at the sterling amounts actually received or paid. Differences on translation in respect of transactions of a capital nature (e.g. the settlement of long term debts) should be treated as revaluation surpluses or deficits. Differences on revenue transactions should be added to or deducted from operating profit'.⁵

No specific guidance was given on forward exchange contracts. However, since all assets are carried at their current value to the business perhaps

it implied that forward contracts which might be considered part of 'stock and other assets purchased for resale' should be revalued at market as of balance sheet date. Furthermore, by analogy, if currency management is considered a significant departure from a company's normal buying pattern insofar as forward currency is purchased 'in advance of normal requirements in order to avoid an expected increase in price', or 'where stock is purchased at a price substantially below, or above, the relevant market buying price at the date of purchase', then 'the total of the relevant surpluses or deficits should be included in the profit and loss account'.⁶

Recent Studies

In his *Accounting Treatment of Overseas Currencies*, Flower accepted the FASB 8 criteria for recognising gains or losses on forward contracts according to the nature of the transaction.

He recommended that 'the spot rates should always be used for the translation of amounts receivable and payable in foreign currency, rather than the forward rate appropriate to the anticipated date of settlement'.⁷ Except 'where amounts receivable or payable in a foreign currency have been specifically covered by a forward foreign exchange contract, their ultimate sterling amount is fixed by the rate at which forward cover has been negotiated and this rate should be used instead of the closing rate'.⁸

In the AICPA research study, *Reporting Foreign Operations of US Companies in US Dollars*, Leonard Lorensen noted that the Accounting Research Bulletin No. 43, the US standard since 1953, 'implied that forward rates should be used to translate some assets if the US company had unperformed forward exchange contracts at the balance sheet date'.⁹ Use of forward rates for translating currency items covered by forward exchange contracts was also accepted by the research study of The Canadian Institute of Chartered Accountants, *Translation of Foreign Currencies*, by R. MacDonald Parkinson.¹⁰ Although Lorensen suggested that unperformed forward

⁶*Ibid.*, pp. 66-67.

⁷Flower, John, *Accounting Treatment of Overseas Currencies: A Background Study*, The Institute of Chartered Accountants in England and Wales, London, 1976, p. 60.

⁸*Ibid.*, p. 67.

⁹Lorensen, Leonard, *Reporting Foreign Operations of US Companies in US Dollars*, Accounting Research Study No. 12, American Institute of Certified Public Accountants, Inc., New York, 1972, pp. 64-65.

¹⁰Parkinson, R. MacDonald, *Translation of Foreign Currencies*, A Research Study, The Canadian Institute of Chartered Accountants, Toronto, 1972, p. 31.

⁴Accounting Standards Committee, *Exposure Draft 18*, 'Current Cost Accounting', London, 30 November 1976.

⁵Inflation Accounting Steering Group, *Guidance Manual on Current Cost Accounting including the Exposure Draft*, Tolley Publishing Company Limited, Croydon, and the Publications Department of the Institute of Chartered Accountants in England and Wales, London, 1976, p. 199.

contracts be carried at market price as assets or liabilities, he rejected the use of forward rates for translation: 'regardless of whether the US company has unperformed forward exchange contracts at the balance sheet date. . . translating the asset or liability at a spot rate in effect at the date of the money price restates it to a dollar money price at the same date, but translating it at a forward rate in effect at the date of the money price restates it to a dollar money price at a later date'.¹¹ The temporal principle of translating foreign currency items into domestic currency accounts implies that the exchange rate used for translating foreign currency items should be that which retains the temporal characteristics of their measurement in the foreign financial statements. Flower accepted 'as persuasive' the arguments by Lorensen against using the future exchange rate to record and translate at the balance sheet date foreign currency assets or liabilities stated at the value of future receipts or payments.

It is precisely the *value* of future receipts or payments that is potentially the most useful aspect of accounting for currency transactions. The critical problems are how such future exchange rates should be estimated and how the money value of future receipts and payments should be calculated. Use of *forward rates* raises the following questions:

- (1) Are forward rates biased predictions of future spot rates?
- (2) Should the risks/opportunities represented as discounts or premiums in forward rates be reported at once, or in the subsequent period when the fluctuation in exchange rate occurs?
- (3) Do forward rates simply reflect the differential between the expected change in purchasing power in two countries? or
- (4) Do forward rates only reflect the differential between the interest rates in two countries?

The first question is partly a matter of fact, and yet is also a question of whether anticipated future prices, if not reflecting any of the conditions of risk premium, interest rates or future purchasing power, should ever be incorporated into an accounting system. The second question revolves around whether and how future contingent risks or opportunities should be recorded as income or expense in the period in which they arise.

If question 3 holds, it is necessary for accuracy to distinguish between interest-bearing and non-interest bearing monetary items; perhaps nominal interest differentials reflect differentials in expected changes in purchasing power.

If question 4 holds, that is, forward rates reflect only interest differentials and not future spot exchange rates, then the value accounting system could be based on two types of calculation. The value of non-interest bearing currency receivables should be the present value denominated in domestic units of money. Either the currency receivable should be restated at the discount value reflecting the domestic cost of money and recorded at the forward exchange rate, or it should be first restated at the discounted value reflecting the foreign cost of money and recorded at the spot rate. Suppose there are the following one year rates: $I_{\$} = 6\%$, $I_{£} = 12\%$, forward $\$/£ = 6\%$ p.a. premium, forward \$1.88, spot \$2.00, and a UK firm records a one year \$100 receivable on the end of year accounting date.

Sterling

$$\begin{aligned} \text{Present Value} &= \frac{FC^i}{\left[\frac{1 + i(I_{£})}{360} \right]} \div F_t^i = \\ &= \frac{\$100}{\left[\frac{1 + .12}{360} \right]} \div \$1.88 = £47.49 \end{aligned}$$

$$\begin{aligned} \text{or} &= \frac{FC^i}{\left[\frac{1 + i(I_{\$})}{360} \right]} \div S_t = \\ &= \frac{\$100}{\left[\frac{1 + .06}{360} \right]} \div \$2.00 = £47.17 \end{aligned}$$

Where FC^i = amount currency receivable of i days maturity

I = interest rate

S_t = spot exchange rate at transaction date

F_t^i = forward exchange rate at transaction date for i days maturity.

Income would be immediately altered by the discounting process, but the implicit interest benefit/cost should then be taken into the Profit and Loss Account over the life of the receivable or payable. (As with banking transactions in Eurocurrencies, it may be appropriate to revalue items as the relevant interest rates change.) In the UK, because of exchange control, the forward rate will not always reflect the differential between internal sterling interest rates and foreign interest rates, so discounting currency items at internal sterling money rates and translating at forward rates is the only method likely to reflect, accurately, the present value in sterling of future cash flows.

In any case, precise accordance with the temporal

¹¹Lorensen, *op. cit.*

principle of accounting implies that the forward use of rates for translation should be accompanied by restatement of the present value of foreign currency items, which is an extension of accounting accuracy. The benefits of this precision must be balanced against the additional processing costs.

Conclusion

Realised exchange gains or losses arise when a foreign currency transaction is received or paid on settlement date at a rate different from the recording rate. Selection of recording rate is therefore crucial, for if spurious or misleading exchange gains or losses arise in the accounts, management decision and control may well be impaired.

We have proposed a system of value accounting based on the use of forward rates for recording currency transactions at transaction date. Besides producing more realistic report accounts, we believe that this approach is particularly beneficial in management accounting. The aim is to create currency awareness by reflecting the impact of fluctuating currencies with more meaning and realism.

Use of forward rates is objective and realistic. The likely benefits include: (1) more sensitive standard costing systems with refined exchange rate variances;

(2) improved information for decisions on pricing, sourcing, invoicing and product and market-mix; (3) more realistic and timely profit reporting and currency-responsibility-oriented performance measurement; and (4) detailed feedback on currency management. In addition, forward rates provide useful nominal transfer prices between group companies in different countries, and for the fair transfer of exchange risk from divisions to a centralised currency management profit centre.

Clearly the costs of such a system of value accounting must be compared with the benefits. The procedures can become complex, but no more complex than the underlying transactions of many major international trading companies. Conversely, oversimplification may mislead, especially in the turbulence of exchange markets witnessed in recent years. Indeed some multinational operations may require more sophisticated information systems, for which the currency accounting system outlined here is but a preface.

The system we have proposed is flexible and can be modified to suit both the management purpose and the scale of operation. This is one of the reasons for specifying the recording procedures in detail. The other reason is that financial accounting standards and research studies have not always examined the complexity and risks involved in the dynamics of currency transactions. A detailed specification may have helped fill the gap. In particular both conventional accounting and proposals for replacement cost and general-price level accounting fail to differentiate the risks and present value of foreign currency monetary items. Using forward rates to record and translate such items, along with stating the current value of future receipts and payments, is an improvement on, or an extension of, some of the important current cost and temporal accounting principles.

Above all, however, value accounting for currency transactions may be a prerequisite for creating currency awareness in international trading operations.

Walter Taplin Prize

The Association of University Teachers of Accounting, the Council of Departments of Accounting Studies and *Accounting and Business Research* offer a prize of £75 for the best article published in each annual volume. The prize is named in honour of the journal's founding editor, Walter Taplin.

The winning article is chosen by the subscribers. Their choice in 1976/77 was Edward Stamp, *ED 18 and Current Cost Accounting: A Review Article* (Spring 1977).

Liquidity Evaluation by Means of Ratio Analysis

Hisham Fadel and John M. Parkinson

Many objectives have been imputed to the firm, though the pragmatic approach of survival would seem to be a necessary, if not a sufficient, condition for the achievement of any other objective. Isolation of the conditions necessary for survival is difficult, but if the definition is extended to survival and the avoidance of failure, then the situation becomes clearer, as the causes of failure may be more easily identified. Principal among these will be lack of liquidity.

Three approaches are in use for the measurement of short term liquidity: balance sheet ratio analysis; cash generation projections from published accounts; and detailed cash budgets. It is not generally possible to calculate detailed cash budgets without access to inside information, and the external party must rely on the other two methods.

The idea of comparing current assets with current liabilities as a measure of creditworthiness seems to have been developed in the USA in the latter part of the nineteenth century, and the belief that this should have a value of about 2:1 came shortly thereafter.¹ That this, or any other, absolute value for the current ratio should be the norm has held less sway of late, as it has been realised that the nature of operations of firms in different industries will make different balance sheet structures appropriate.

This variability is likely to exist among industries and may exist among firms within industries which have different operating methods. It is suggested that normative interpretation of these ratios is therefore difficult and that even comparative interpretation (against other firms, across time series) is beset with potential pitfalls. For example, if the current ratio of a firm rises from 1.9:1 to 2.1:1 we may be able to say that it is more liquid (according to the definition of liquidity inherent in the current ratio) but we do not know whether the change was desirable or not unless we know what the ratio should have been in each of the years.

It is also widely known that judicious manipulation of the situation at the end of the year may have a window dressing effect which leads these ratios to look better than is implied by the liquidity situation which obtains through the rest of the year.

A more fundamental criticism of these ratios is that the notion of liquidity which they measure is based upon a false analogy of the role of current assets and current liabilities within the firm. The current ratio compares total current assets with total current liabilities, and the more exacting quick ratio compares total quick assets (current assets less stocks) with current liabilities. In both cases the measure of liquidity seems to be based on the idea of the assets paying off the liabilities in some way. This, however, ignores the dynamic nature of the problem.

The pragmatic process of liquidity management is to engage in a constant paying off of existing current liabilities, while at the same time incurring new ones, and also a constant process of realising current assets (such as debtors) and generating new ones by way of fresh sales. As such the total current assets never become realised (nor yet the quick assets) and the total current liabilities never become fully paid off, and any comparison of these totals is not a direct measure of the ability of the firm to meet its current obligations as and when they fall due.²

The idea may be illustrated by a comparison of firms in two disparate industries, say, retailing and engineering. Each may have similar levels of stocks and of current liabilities. The retailer, however, is likely to have no debtors as all sales are effected on a cash basis, whilst the engineering firm is likely to have substantial debtors (perhaps a little more than trade creditors). Assuming that the amount of cash and marketable securities is small in comparison to current liabilities, the ability of each company to meet its obligations and pay its creditors at the end of the month will be related to its ability to generate

¹Horrigan, J. O., 'A Short History of Financial Ratio Analysis', *Accounting Review*, April 1968, pp. 284-293.

²For a more detailed account of how trade credit is managed see Parkinson, J. M., 'The Management of Trade Creditors', *Management Decision*, 1976, pp. 161-176.



cash during the month compared with the cash needed to settle debts which become due for payment by the month end.

Although the balance sheet ratios would have us believe that the firms' liquidities are different, effective liquidity may be the same, providing each has the same ability to get cash receipts, whether from the sale of goods for cash in the case of the retailer, or the collection of debtors in the case of the engineering firm. Liquidity is then a function not of assets and liabilities, but of the flow of cash into and out of the firm.

Despite these shortcomings the balance sheet ratios (and in particular the current ratio) have been in widespread use for many years, and enjoy considerable respectability. Their use in predicting corporate failure has been indicated in the research of Merwin³ and also Tamari⁴ where it was suggested that the current ratios of failed firms were in general less than those of the industry as a whole. Their use in such predictions is, however, generally as part of a range of ratios which give a broad picture of the firm under consideration, and their independent use is not indicated to the same extent.

In order to get away from some of the static nature of balance sheet ratios, Beaver⁵ used the concept of cash flow, defined as net profit plus depreciation. This is analogous to Walter's⁶ definition: 'Net cash flows are defined as the difference between dollar sales and costs excluding non-cash charges, but they can also be viewed as the total sum of net earnings (before or after taxes), depreciation expense and other non-cash charges.' The ratio of cash flow to total debt (long term debt plus current liabilities) was employed in an investigation of the ability of ratios to predict the failure of firms. Of all the ratios used in Beaver's study this was considered to be the strongest indicator of business failure.

This ratio was also used by Lev⁷ in another study using the same data, but with a different statistical technique, i.e. the balance sheet decomposition measure. Lev suggested that this ratio was the only

one which outperformed measures based on static balance sheet information in the prediction of failure.

These recent approaches treat liquidity as a function of flows of funds rather than stocks of funds and liabilities. The finding that the cash flow/total debt ratio proves a better indicator of failure and hence liquidity than do the balance sheet ratios would seem to stem from the dynamic nature of the cash flow element. However this still leaves debt as a static item, and effectiveness should be improved still further by changing this from a static figure of debt at a certain point in time to a measure of the outflow of funds over a period of time.

This argument is illustrated by Sorter and Benston⁸ who put forward a new approach to liquidity evaluation which they called the interval measure. They considered that a firm had certain defensive assets, such as cash and debtors (but not stocks), out of which items it was required to satisfy projected expenditure. This outflow was capable of being approximated by taking the costs, direct and indirect, from the current profit and loss account, and adjusting for non-cash expenses, such as depreciation, and known future changes in operations. These interval measures can be calculated for a variety of situations which will reflect different assumptions about the changes in the environment with which the firm has to cope. In each case the measure is expressed as a number of days through which the company could survive, under the specified conditions. The more important of these are summarised in Table 1.

The ratios in Table 1 are by no means exhaustive, and Sorter and Benston point out that an interval measure can be designed to accommodate any combination of eventualities, thus making it a highly flexible tool.

The advantages of the interval measures over the balance sheet ratios are considerable. In particular they seem to be relatively immune to the displaying of untypical results, whether deliberate or fortuitous. They are also held up as more comprehensible than balance sheet ratios, being expressed as a number of days through which the firm could survive under the specified conditions, rather than a ratio which is capable of being not understood, or worse, misunderstood.

Davidson, Sorter and Kalle⁹ used these interval measures in conjunction with the balance sheet ratios in an empirical analysis. They concluded that

³Merwin, C. L., *Financing Small Companies in Five Manufacturing Industries 1926-36* (New York: National Bureau of Economic Research, 1942).

⁴Tamari, M., 'Financial Ratios as a Means of Forecasting Bankruptcy', *Management International Review*, 1966/4, pp. 15-21.

⁵Beaver, W. H., 'Financial Ratios as Predictors of Failure', *Empirical Research in Accounting: Selected Studies*, 1966. Supplement to Volume 4 of *Journal of Accounting Research*.

⁶Walter, J. E., 'Determination of Technical Solvency', *Journal of Business*, January 1957, pp. 30-43.

⁷Lev, B., *Financial Statement Analysis, A New Approach* (New Jersey: Prentice Hall, 1974).

⁸Sorter, G. H., and Benston, G. 'Appraising the Defensive Position of a Firm: The Interval Measure'. *Accounting Review*, October 1960, pp. 633-640.

⁹Davidson, S., Sorter, G. H. and Kalle, H., 'Measuring the Defensive Position of a Firm' *Financial Analysts' Journal*, Jan/Feb 1964, pp. 23-29.

Table 1
Sorter & Benston's Interval Measures

<i>Title</i>	<i>Definition</i>
1 Basic Defensive Interval	Defensive Assets Projected Daily Expenditure
2 No Credit Interval	Defensive Assets – Actual Liabilities Projected Daily Expenditure
3 Cash Interval	Cash + Marketable Securities Projected Daily Expenditure
4 Reduced Sales Interval	Defensive Assets Projected Daily Expenditure – Projected Daily Receipts
5 Reduced Operations Interval	Defensive Assets Projected Daily Expenditure at Reduced Level of Operations

a firm's ranking on a liquidity scale according to defensive intervals is substantially different from the ranking obtained from the current ratio. Additionally the two approaches, even when moving in the same general direction, would give conflicting versions of the magnitude of any change in liquidity. They also produced data to show that in the case of individual companies, the general impression given by the interval measures was superior to that given by the balance sheet ratios.

It is believed, however, that the interval measures, though demonstrated to be sounder than the balance sheet ratios, do not adequately cater for the typical situation of a firm which operates in such a way that current income is its normal source of funds for the payment of debts due to creditors. Overcoming this deficiency entails replacement of the static idea of defensive assets, with some notion of cash inflow from trading operations. In this context cash flow as used by Walter and Beaver in the articles cited in footnotes 5 and 6 would seem a good choice, particularly as it has in turn proved a good indicator of liquidity.

This concept was adopted by Bierman¹⁰ in his description of how funds flow data should be incorporated into liquidity evaluation. He related the net cash inflow to the excess of current liabilities over current assets, and also over quick assets, as well as repeating Beaver's relationship of total debt and net

cash flow. He also considered the case of a firm which had an excess of current assets over current liabilities, but which, due to unsuccessful trading, had a net loss of funds arising from operations. In each case the results were expressed as a number of days.

Whilst this would seem to be a step forward, the approach still suffers from the erroneous assumption that debtors and creditors are going to be settled *in toto*, and that any deficiency need be funded from trading operations. As is succinctly put by Walter:

Under the going concern hypothesis, current liabilities are never wholly discharged; nor – by analogous reasoning – are current assets ever entirely available to meet currently maturing obligations.

The solvency of a firm would seem to be predicated upon four main factors:

- (a) A sufficiency of cash to cope with the short term uncertainty inherent in a situation where the firm has incomplete control over the collection of receivables etc.
- (b) A flow of funds from operations of at least nil, thus enabling it to settle its obligations as and when they arise.
- (c) The ability to generate such additional funds as are necessary to ride out the troughs of any cyclicity inherent in the trade or economy in which it operates.
- (d) The ability to generate such additional funds as are necessary to fund any more or less permanent changes in the structure of the balance sheet.

¹⁰Bierman, H. J., 'Measuring Financial Liquidity', *Accounting Review*, October 1960, pp. 628–632.

The authors believe that traditional balance sheet ratio analysis is suitable for the measurement of (a) and (c) (immediate and longer term variability), but that items (b) and (d) can best be measured by the application of the notion of cash flow, and the relation of this cash flow to the job one envisages it doing, whether that be the reduction of creditors, the repayment of long term debt, the increase of debtors, the purchase of fixed assets, or whatever.

In practice these ratios may be expressed by relating the cash-flow generated in one day to the particular changes envisaged. We shall refer to this as the 'daily net cash flow'.

If a measure of liquidity is to be of use it must go further than mere description. It ought to have some ability to predict how well or how badly the firm will do in future time periods. The ratio of profit to capital employed is used here as an overall measure of the success of the firm, and it is by the ability to predict this factor that various ratios are compared. It is not that we wish to measure the ability of each ratio to predict this ratio *per se*, but more that we wish to have some means of distinguishing those which are good predictors of success from those which are less good.

The empirical study

Various ratios have been computed through the use of the SCAN databank.¹¹ This contains financial information derived from published accounts for all companies quoted on the London Stock Exchange.

The building materials and aggregates industry has been selected, primarily for its connection with the construction industry which has been the subject of

previous research in a related field.¹² The data are processed for 94 firms in this sector which traded during the period 1971-1975 and which had published accounts for five consecutive years in that period. The lower time limit, 1971, includes accounts published for periods ending between 1 January 1971 and 1 January 1972 inclusive. The upper time limit, 1975, includes accounts published for periods ending between 1 January 1975 and 1 January 1976 inclusive. Thus some allowance is made for variations in year ends. Some firms have been excluded from the study because of non-comparable data, either within firms, or between firms, over the five year period. However those that remain comprise the bulk of the population of firms in this sector of the UK economy. The industry total figures are presented in Table 2, together with some statistics derived therefrom for the most recent year (1975) in Table 3.

The ratios included in the study, and the reasons for their inclusion are presented in Table 4.

It would have been preferable to have included the current ratio and the quick ratio in the study, but data for their computation are not available from the SCAN databank. However, these ratios were out-performed as predictors of failure by the ratio of working capital to total assets in Altman's study.¹³ The ratio of working capital as a percentage of capital employed, as used in this study (ratio 3 in Table 4) would therefore seem to be an adequate substitute for both current and quick ratios.

The data were divided into quartiles according to

¹¹Fadel, H., 'SCAN Data Bank', *Working Paper*, University of Bradford, School of Operations Management, 1976.

¹²Fadel, H., 'The Predictive Power of Financial Ratios in the British Construction Industry', *Journal of Business Finance and Accounting*, 1977.

¹³Altman, E. I., 'Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy', *Journal of Finance*, September 1968, pp. 589-609.

Table 2

Building Materials and Aggregates Industry (94 firms)
Financial Data - Totals (£'000s)

Years	1971	1972	1973	1974	1975
<i>Variables</i>					
Total Equity	715,771	838,185	1,022,664	1,226,580	1,333,200
Capital Employed	1,040,831	1,219,692	1,477,444	1,794,311	2,032,734
Profit	141,012	189,436	268,319	278,095	263,995
Sales	1,866,760	2,121,724	2,607,612	3,242,427	3,636,994
Net Fixed Assets	827,591	987,925	1,186,041	1,461,689	1,544,819
Working Capital	213,240	231,767	291,403	332,622	487,915

Table 3

Building Materials and Aggregates Industry (94 firms)
Some Statistical Data based on 1975 totals (£'000s)

<i>Statistics</i>	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>Range</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Coefficient of Variation %</i>
<i>Variables</i>							
Total Equity	14,183	4,819	32,873	276,605	295	276,900	232
Capital Employed	21,625	6,477	50,153	410,088	312	410,400	232
Profit	2,808	800	5,741	42,793	-293	42,500	204
Sales	38,691	12,721	68,258	411,649	251	411,900	176
Net Fixed Assets	16,434	3,370	42,641	348,639	61	348,700	259
Working Capital	5,191	1,787	9,082	65,838	-4,138	61,700	175

Table 4

<i>Ratio</i>	<i>Reason for Selection</i>
1 Pretax profit as a percentage of capital employed.	A measure of the general performance of the firm (the dependent variable).
2 Cash flow as a percentage of total debt.	This was the best predictor of corporate failure in Beaver's study (footnote 5).
3 Working capital as a percentage of capital employed.	This is similar to the ratio of working capital to total assets which performed well as a predictor of failure in Altman's study and also that of Merwin (footnotes 13 and 3).
4 Cash flow as a percentage of sales.	This performed well as a predictor of failure in Lev's study (footnote 7).
5 Working capital to bank overdraft.	It is believed that this ratio may act as a measure of the extent to which working capital is funded from bank borrowings which would seem important from a pragmatic point of view.
6 Long term debt as a percentage of total equity.	These are substitutes for the conventional gearing (leverage) ratios.
7 Total debt as a percentage of total equity.	
8 Cash flow to interest charges.	This is important as a measure of the cost of achieving a given level of liquidity.
9 Daily net cash flow.	The proposed measures of liquidity which would be indicated from the present study under the assumption that various debts would have to be paid off out of current cash flow.
10 Bank overdraft to daily net cash flow.	
11 Long term debt to daily net cash flow.	
12 Total debt to daily net cash flow.	

Table 5

Building Materials and Aggregates Industry (94 firms)
Results of Contingency Table and Chi-Square Analysis

	1971/72		1972/73		1973/74		1974/75		Level of Significance*			
	χ^2	contingency coefficient	χ^2	contingency coefficient	χ^2	contingency coefficient	χ^2	contingency coefficient	71/72	72/73	73/74	74/75
1 Pretax profit as percentage of capital employed	48.7	.58	71.0	.66	50.4	.59	37.2	.53	.1	.1	.1	.1
2 Cash flow as percentage of total debt	23.3	.45	22.6	.45	17.7	.40	39.8	.55	1	1	5	.1
3 Working capital as percentage of capital employed	10.9	.32	14.9	.37	22.8	.44	22.4	.44			1	1
4 Cash flow as percentage of sales	20.4	.42	6.0	.25	4.2	.21	6.9	.26	5			
5 Working capital to bank overdraft	14.2	.39	2.8	.11	6.7	.29	25.0	.50				1
6 Long term debt as percentage of total equity	16.0	.38	14.1	.36	33.2	.51	23.6	.45			.1	1
7 Total debt as percentage of total equity	11.7	.33	10.1	.31	30.0	.49	30.7	.50			.1	.1
8 Cash flow to interest charges	10.7	.34	12.5	.37	16.2	.40	31.7	.52				.1
9 Daily net cash flow	13.8	.36	9.2	.30	6.3	.25	15.9	.41				
10 Bank overdraft to daily net cash flow	22.1	.45	10.9	.32	11.2	.33	23.8	.45	1			1
11 Long term debt to daily net cash flow	21.4	.43	22.4	.44	33.3	.51	40.9	.55	5	1	.1	.1
12 Total debt to daily net cash flow	22.4	.44	22.2	.44	25.4	.46	51.6	.60	1	1	1	.1

*Levels of Significance: .1, 1, or 5 means that the value of χ^2 is statistically significant at the .1%, 1% or 5% level with 9 degrees of freedom.

the value of each ratio, and according to the value of the ratio of pretax profit as a percentage of capital employed for the following year. A sixteen cell contingency table was thus constructed (four quartiles under investigation multiplied by four quartiles of the dependent variable). The ratios were tested as predictors of the dependent variable using the chi-square distribution as a test of significance.

The chi-square test is a sound statistical test for financial ratios as their distribution is subject to some question.¹⁴ The chi-square test is insensitive to differences in the tails of the distribution. The division of the data into quartiles is a further aid in avoiding this problem. It is also worth mentioning that the frequency of firms in each cell was at least 5 which satisfies one of the statistical requirements for a chi-square test.¹⁵ The results of the test are shown in Table 5.

The results of the statistical test suggest that there is an association between some ratios and the return on capital of the following year. The strength of this association is measured by the contingency coefficient, which ranges from zero to 0.866 for these (four by four) contingency tables. The closer the value of the contingency coefficient is to 0.866, the stronger the association is. The following were the strongest

indicators among the twelve ratios used:

- (a) The best predictor of the return on capital employed is the same ratio for the previous year. This result supports the findings of Whittington¹⁶ in his study of the prediction of profitability (ratio 1).
- (b) Total debt to daily net cash flow (ratio 12). Long term debt to daily net cash flow (ratio 11). Cash flow as percentage of total debt (ratio 2). These three ratios all performed well, the results being statistically significant in each year, though sometimes only at the 5% level.

Conclusion

The findings of this research lend support to the importance of cash flow ratios in measuring the liquidity of a firm. They indicate, moreover, a predictive ability which may aid both internal and external users of financial information in the decision making process. Two of the proposed ratios, the ratio of total debt to daily net cash flow and the ratio of long term debt to daily net cash flow, outperformed all the other liquidity and cash flow ratios examined in this study. It may also be suggested that the ratio of cash flow as a percentage of total debt is a good predictor of return on capital employed, though to a marginally lesser extent.

¹⁴Deakin, E. B., 'Distributions of Financial Accounting Ratios: Some Empirical Evidence', *Accounting Review*, January 1976, pp. 90-96.

¹⁵Siegel, S., *Non-Parametric Statistics for the Behavioral Sciences*, (New York: McGraw Hill, 1956).

¹⁶Whittington, G., *The Prediction of Profitability and Other Studies of Company Behaviour* (Cambridge University Press, 1971).

A Review of EDP Auditing

G. D. Pound

Structure

This paper will examine the ways in which audit techniques have been affected by both the increasing use and technological development of electronic data processing systems in business and commerce. The paper has as its basis a general review of the relevant literature since 1972. The issues raised are generally applicable to many auditing environments, but to some degree will reflect an Australian context. In outline, aspects covered are:

1. The development of computer use and the problems thereby generated for the audit profession.
2. Early developments in the audit of computer-based EDP systems: auditing 'around the computer'.
3. The test deck technique: 'through' or 'around' the computer?
4. The development of integrated test facilities, an extension of the test deck approach.
5. Internal control: an overview of control requirements in EDP systems, and the problems of their application to the audits of more advanced systems.
6. Auditing through the computer: the use of audit packages.
7. The complexities introduced by the use of computer service bureaux.
8. On-line real-time and the additional audit problems involved.
9. Educational problems for auditing computer-based systems.

Computers have been commercially available in the UK and USA since the early 1950s and in that time their use has spread into a great variety of organisations. The growth in computer use has been accompanied by the development of increasingly sophisticated hardware, and, to make full use of the available equipment, increasingly sophisticated computer-based data processing systems. These developments have radically altered the practical capacity of organisations to collect, manipulate, store, analyse and report data.

The auditing profession has responded to these developments in EDP through a re-allocation of resources toward the study and development of

techniques appropriate for the audit of computer-based systems.

This need to adapt to change has in part been prompted by the profession's concern regarding exposure to legal liability. A survey conducted in the USA¹ has revealed that as a result of an increase in litigation against certified public accountants, one of the major areas where the attention of auditing has been intensified is in the review of computerised accounting systems. The Equity Funding case² has also emphasised the need for auditors to be involved in the EDP function through a review of the internal control system and the subsequent testing of that system. This case, while not the only instance of computer abuse,³ is the 'greatest crisis for the public accounting profession since the McKesson and Robbins fraud of the 1930s'⁴ and has, therefore, received widespread publicity. This publicity has caused concern over auditing standards, although the AICPA Special Committee on Equity Funding⁵ stated that 'A knowledge of computer audit techniques was not essential to the detection of the Equity Funding fraud. Manual application of customary auditing procedures would have provided

¹J. P. Bedinfield, 'The Effect of Recent Litigation on Audit Practice', *Journal of Accountancy*, May 1974.

²For further details on the Equity Funding Corporation of America fraud, refer to: R. A. McLaughlin, 'Equity Funding: Everyone is Pointing at the Computer', *Data-mation*, June 1973, pp. 88-91; and F. Andrews, 'Why Didn't Auditors Find Something Wrong with Equity Funding?' in Carmichael, Douglas R. and Willingham, John J., *Perspectives in Auditing*, 2nd edition, New York, McGraw-Hill Book Company, 1975, pp. 225-233.

³For more information on the incidence of various types of computer abuse, refer to: C. Nottingham, 'Conceptual Framework for Improved Computer Audits', *Accounting and Business Research*, Spring 1976, pp. 140-41.

⁴K. Cooper and S. Flory, 'Lessons from McKesson and Equity Funding', *CPA Journal*, April, 1976, p. 19.

⁵AICPA, 'Report of the Special Committee on Equity Funding: The Adequacy of Auditing Standards and Procedures Currently Applied in the Examination of Financial Statements', AICPA, New York, 1975. This committee was appointed in May 1973, with the report being dated February 1975, although it was not released to the public until June 1975.

a reasonable degree of assurance that the fraud would be uncovered'.

When an auditor provides an opinion on a set of financial statements, he is holding himself out to be competent to do so, therefore implying that the opinion has been arrived at through the application of accepted auditing standards.⁶ If financial statement data are processed through an EDP based system, external parties are entitled to expect the auditor to have shown some degree of familiarity with these systems in reaching the audit opinion.

Fundamental to the audit of accounting systems is an evaluation of the client's existing system of internal control.⁷ Both the Australian and American Statements of Auditing Standards imply that a computer-based audit must be performed by an auditor with an adequate knowledge of computer-based accounting systems;⁸ without such personal knowledge the auditor must rely on the advice of DP specialists. To maintain the degree of competence of evidence, however, 'direct personal knowledge . . . is more conclusive than information obtained indirectly'.⁹

It is common practice for an auditor to issue a 'Management Letter'¹⁰ after his examination of a client's internal control system. The management of a client organisation which uses EDP techniques

is entitled to assume the auditor has the necessary degree of EDP expertise to draft an authoritative management letter. In fact, the Management Letter serves to expose, in a more direct way than the audit report, the degree of professional skill and understanding put into an audit. It is the writer's opinion that many firms under audit relate the quality of the audit to the management letter. For this reason alone it is important that the auditor of a computer-based system attains a strong working knowledge of that particular system.

Over and above this, of course, is the fundamental requirement of the auditing profession that it be perceived by readers of financial statements as competent to cope with a new and developing environment. In summary, a major problem confronting the profession is the task of adapting procedures and techniques to suit the changing circumstances that have evolved through the development of EDP systems, in order that its members may satisfactorily discharge their responsibilities.

It has been suggested that the auditing profession in general has not yet adapted to a dynamic EDP environment. The general lack of competence in this area is said to be reflected in the fact that no major computer fraud has been discovered by auditors to date.¹¹ This proposition, however, is difficult to support as there are no figures available to indicate the number of major frauds discovered by auditors in manual accounting systems. Many frauds discovered by auditors in manual systems are relatively small, and are dealt with by the auditor and his client. In relation to prosecutions, however, there are only a few major cases that have been as widely publicised as the Equity Funding case, but all of these have been related to manual systems. While not claiming that auditors in general are adequately qualified to conduct audits on EDP systems, to assert a general lack of EDP audit competence on the basis of one isolated case is unacceptable.

⁶An example of these standards is found in CS.1, *Statement of Auditing Standards*, issued by the Institute of Chartered Accountants in Australia. Paragraph 30 of CS.1 states:

'An auditor must consider the nature of the client's business and evaluate the system of internal control to determine the nature, extent and timing of the audit procedures to be used.'

⁷Internal control comprises the plan of organisation and all of the co-ordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency and encourage adherence to prescribed managerial policies. This definition possibly is broader than the meaning sometimes attributed to the term. It recognises that a 'system' of internal control extends beyond those matters which relate directly to the functions of the accounting and financial departments, AICPA Committee on Auditing Procedure.

⁸CS.1, *op cit.*, para 16: 'An audit must be performed by or under the effective control of an experienced and competent auditor'.

Statement on Auditing Standard (SAS) No. 1 'Codifications of Auditing Standards and Procedures', AICPA, 1973, section 210.1: 'The examination is to be performed by a person or persons having adequate technical training and proficiency as an auditor'.

⁹CS.1, *op cit.*, para, 41(c).

¹⁰It is the responsibility of the auditor to identify weaknesses in internal control for the purpose of his audit and to attempt to have any weaknesses promptly corrected. When the auditor becomes aware of weaknesses in internal

control he should report them promptly to the management. This is usually done through the auditor issuing a 'Management Letter'. The purposes of this letter are to:

- (i) Provide a formal report to management on the matters which do or could affect the company accounts and the audit thereof.
- (ii) Encourage corrective action, especially for the purpose of audit reliance on the accounting records or data.

Weaknesses and deficiencies not directly related to the accounting system form part of the management letter since they can influence the operational efficiency and adherence to prescribed managerial policies.

¹¹C. Burn, 'Auditing the Computer', *Accountant*, January 1975.

The emergence of technical bulletins and statements by the professional accounting bodies throughout the world during recent years indicates the realisation that EDP auditing does require change, and that adaptive action is being taken.

The early thoughts

During the early years of EDP development, the relatively basic technology and use of EDP accounting systems provided the auditor with very little incentive or need to dramatically alter his audit approach and techniques. During this phase of the computer evolution, the batch processing approach could be adequately examined by the 'around the computer' audit, although the auditor still needed to consider the framework in which the processing was being performed.

In general terms an accounting system can be said to comprise three basic elements: (a) input (b) processing (c) output. The processing aspect was largely ignored under the 'around the computer' approach. In effect the requirement of an audit trail,¹² as is present in manual systems, was maintained. Source documents providing input to the computer were selected and summarised manually so as to be compatible with the computer output. The auditor was then able to reconcile input and output generally, in terms of batch totals, or select specific transactions, thereby following the path of data processing around the computer. As the batch was processed through the edit program, totals were accumulated for accepted and rejected records, and if all the control totals balanced the batch was accepted. The auditor would pay particular attention to evaluating the control over rejected transactions, and their subsequent correction and re-submission to ensure the completeness of processing. Here the auditor would review edit reports and error listings, investigate the reasons for the errors, and follow up the controls over resubmission.

The around the computer audit approach is not at present highly regarded,¹³ given the advances that have been made in computer auditing techniques. It is, however, felt that if all controls being evaluated are well documented, and a visible audit trail exists,

then treating the computer as a 'black box' can be adequate. That is, an inference can be drawn about what the program is doing by examining the input (source documents) and resultant output (error listings, edit reports, transactions registers and reports). As in all audits, the audit program in a batch processing system must indicate the work to be completed by the audit team, and should be written to test the controls over input, rejections, updating and master file amendments.

The 'around the computer' audit implicitly assumes that the computer does not exist, in the sense that audit procedures appropriate in a manual system are still acceptable as they stand. Further, it assumes that the computer cannot be used to falsify or misappropriate assets,¹⁴ without this being detected by manual audit procedures.

In relation to the first assumption, it can be argued that because computer-based systems have introduced different means of processing, storing and recording accounting data, continued application of traditional manual audit techniques must clearly prove deficient. With the second assumption, events such as the Equity Funding case have dispelled any early belief that the computer could not be used to falsify records. Recognition of the unreality of both these assumptions explains the belief about the basic inadequacy of auditing 'around the computer'.

Test deck

One of the earliest forms of computer based audit technique developed to verify the accounting process and to test compliance with processing controls is the test deck. This technique derives its name from the fact that originally it made use of a deck of punched cards, containing a series of test data compiled to test the operation of a computer program. For a thorough test, the test data should include examples of both valid and erroneous data. The auditor, having manually calculated the output in advance, examines the actual computer output to ensure all the test transactions have been processed through the computer as expected. If the data has not been processed as expected, the auditor needs to determine the source of the discrepancy. Most errors arise from a failure by a data preparation operator to transcribe data correctly, or from faulty reading by the computer input device. If these errors do not account for the discrepancy, then the auditor may be forced to investigate the program itself.

¹²An audit trail exists if the means are available of systematically tracing the progress of data through a system from source to completion, or from output back to the original source document. The purpose of an audit trail is to verify the validity and accuracy of the process.

¹³A. D. Chambers, 'Audit Test Packs and Computer Audit Programs', *Computer Journal*, May 1975; K. O. Dorricott, 'Appraising Computer Assisted Audit Techniques', *CA Magazine* (Canada), August 1975.

¹⁴C. O. Smith and G. F. Jasper, 'Using the Computer in Audit Work', *Management Accounting* (USA), October 1972.

From the auditor's point of view, the test deck represents a 'through the computer' technique, but as far as DP personnel are concerned, the auditor has not really 'looked into' the computer processing stage sufficiently to warrant that description. It is, however, unlikely that the term 'through the computer' can be justified in terms of understanding the detailed logic of a computer program in any situation. A person regarded as a DP expert is unlikely to understand completely the detailed logic of another DP expert's program, without a great deal of work, and even then he may overlook some subtle (fraudulent) aspects of the program. The auditor needs only to look at the specifications in order to use the test deck approach, which will prove either that the program works or it does not.

To look at the detailed program logic implies that the auditor's primary function is to detect fraud. This is however an ancillary objective, to be probed further only if the circumstances warrant suspicion.¹⁵ The aim of the test deck is to test the system to ensure it is operating as the specifications suggest it should. The meaning attached to 'auditing through the computer' is not clear, but if it is taken to require a detailed review of the program logic, then it is going beyond the role of the auditor. The question as to whether a test deck can be classified as a 'through the computer' technique is therefore open to further clarification.

Despite the apparent simplicity of such a technique, test decks have not found general acceptance in the audit of all types of computer systems. It has been asserted that there are inherent limitations to the usefulness of test deck techniques in auditing.¹⁶ Such limitations include:

1. The test is run at a specific point in time on a specific program at that point in time. For a program that has undergone major changes during the period under audit, a test deck may have become obsolete. Further, if a program is changed frequently and documentation of the changes is poor, the accuracy of the updating of a test deck may become suspect.
2. It is often difficult to ensure that the program being used during the testing is in fact the one the client uses regularly. This can be overcome to a certain extent by making surprise visits so as to

limit the opportunity for the operator to switch programs. This, however, involves certain technical and operational difficulties.

3. Test decks cannot cover all combinations of conditions. Such a technique is only partially conclusive, and may not detect fraudulent manipulation of data. For example, a test deck of forty transactions will not detect the program which treats the forty-first transaction differently.

4. In order to properly prepare a test deck and calculate the predetermined results, a time consuming, in-depth review of the system and controls must be completed. Nevertheless, such a task will be an important benefit to the auditor in completing his audit engagement.

5. The auditor must be able to solicit cooperation from DP personnel,¹⁷ especially in getting computer time. In addition, he must attain the competence to design, run and control the test. If he requires to run his test deck on an outside computer, he must get agreement to take away a copy of his client's actual file.

6. Obtaining explanations for any unusual results may involve time consuming and laborious checking of the program, but will almost certainly be welcomed by the DP people who want their system to be as clean and predictable as possible. This of course puts a premium on systems documentation.

While these limitations do not invalidate the use of test decks (and test decks are in fact well established and accepted in a batch controlled situation), they do suggest that alternative or additional techniques may be necessary. The use of test decks is really supplementary to manual tests on actual transactions, and should only be used where the manual tests are not considered adequate by the auditor for testing all the significant controls.

Integrated test facility

A development which is gaining some prominence at present is the integrated test facility (ITF) or mini-company approach, which is an extension of the test deck technique. The concept of ITF involves the creation of a mini-company or dummy entity on the live master files of specified applications, and the subsequent processing of selected transactions against that dummy entity through normal processing runs. The results are then checked against the auditor's predetermined output. This technique differs from

¹⁵Stettler, H. F., *Systems Based Independent Audits*, 2nd ed., New Jersey, Prentice-Hall, 1974, p. 35.

¹⁶A. D. Chambers, *op. cit.*; K. O. Dorricott, *op. cit.*; G. H. Kiefer, 'Systems Auditing with Test Decks', *Management Accounting (USA)*, June 1972; H. D. Laursen, and W. E. Kuntz, 'A Key to the Computer', *South African Chartered Accountant*, March 1972.

¹⁷Soliciting cooperation from DP personnel is analogous to the auditor requesting cooperation and information from an accountant. In both cases the competence of these people is under review.

a test deck in that it uses live files and a normal processing run to test the system, whereas the test deck is usually run separately from the normal processing cycle. These differences provide the main advantages claimed for the ITF technique.¹⁸ By using live files and being an integral part of the normal processing cycle, ITF allows the audit of the system on a continuous basis with the DP personnel not being aware of the check being performed. In this way superior audit trail evidence is provided.

Of course there are certain problems associated with application of the ITF technique. There is the need to maintain the facility, and to remove the test transactions which have been mixed with the normal data. Test data can be removed either through a modification of the program or by using reversing entries.¹⁹ The first method has the advantage of leaving the normal run unaffected if there are any errors in the test data, but of course the maintenance of this method requires that the program be continually updated in the event of the client modifying his system. The second method does not require program modification, but is dependent upon the reversing entries being precise. Incorrect reversing entries will cause upsets with the live files – a fact which appears to be making auditors hesitant to use this approach. In short, the effectiveness of ITF as a technique is dependent upon the auditor's ability to develop viable test data, and to control its processing and reversal.

ITF, as a general concept, is considered by some writers to be more suited to an internal rather than an external audit²⁰ since it is part of the normal processing cycle, but once the technique is fully understood and applied by both internal and external auditors interacting together, it may prove to be a most valuable tool, especially where an on-line system is operative.

A survey has been conducted in the USA to ascertain the awareness and acceptance of ITF as a new and promising technique.²¹ The main conclusions of this survey are:

1. ITF is being used by all types of businesses surveyed and in all major computerised financial applications.

2. The potential problems of ITF have been overcome by a number of users, the major problem still being the removal of the test transactions.

3. External auditors are unwilling to use ITF because of the problem of using the client's live files.

Despite conclusion 3, ITF has the potential to be a valuable audit technique in the future if properly developed and controlled.

Internal control

No matter what type of system is being audited (manual or EDP), the importance of internal control evaluation as the basis for an audit cannot be over emphasised.²² In a computer-based system, however, the auditor must deal with control methods and requirements that differ in nature to those of a manual system.

Internal control²³ is recognised as a vital feature of modern management, with the extent and effectiveness of internal control being just as important to the auditor. The use of an EDP system, no matter how small, large or sophisticated does not in any way reduce the need for the auditor to evaluate the reliability of that system in determining the scope and character of the audit. The introduction of new controls (over such areas as systems development and testing, i.e. authorisation of systems and programs, the use of programs and tapes and the detection and correction of errors), and, on the other hand, the erosion of the basic element of internal control (i.e. separation of functional responsibilities and exercise of human judgement), are two aspects of EDP systems which must be considered in the evaluation of controls. In a manual system the element of human judgement is present in the form of an employee using his commonsense, experience and knowledge of the firm's transactions to assess the validity and/or reasonableness of a particular item

¹⁸B. R. Chaiken and W. E. Perry, 'ITF – A Promising Computer Audit Technique', *Journal of Accountancy*, February 1973; K. O. Dorricott, *op. cit.*; R. Weber, 'Auditing Computer Systems using Integrated Test Facility', *Australian Accountant*, May 1975.

¹⁹*ibid.*

²⁰*ibid.*

²¹B. R. Chaiken and W. E. Perry, *op. cit.*

²²Refer footnotes 6 and 7. Technical Bulletin, F.2, 'Internal Control in a Computer-based Accounting System', issued by the Institute of Chartered Accountants in Australia, and the Australian Society of Accountants, para. 2 states:

'The introduction of a computer-based accounting system in no way affects the normal principles of internal control but other factors have to be considered due to features that are not present in other accounting systems'.

This is also supported by Statements on Auditing, U14, 'Internal Control in a Computer-based Accounting System' issued by The Institute of Chartered Accountants in England and Wales, para. 1.

²³Internal control has been defined in footnote 7, and needs to be distinguished from internal check. Internal check comprises the checks on the day to day transactions which operate continuously as part of the routine system whereby the work of one person is proved independently or complementarily to another.

and its accounting treatment, even after other persons have handled the transaction. The introduction of EDP removes this element of control as the computer will process the item as instructed. Consequently fewer, if any, personnel will process or check a transaction, especially in the more advanced systems.²⁴ Unless detected by system checks (e.g. batch control and hash total techniques), the computer will accept wrong data and there is therefore a greater possibility than in a manual system that an erroneous result will be produced.

Further to this, most EDP departments suffer from control problems arising from the concentration of responsibility amongst few people. Concentration of controls and work in the one department reduces the extent to which responsibilities can be divided and independent checking can be performed.²⁵ The evaluation of internal control is therefore probably more vital in the audit of an EDP system than in a conventional manual system. It is generally accepted²⁶ that no one can prevent massive collusion. In any system review, the auditor is limited to determining whether the system is such that a relatively large number of people must be involved in order to circumvent the internal controls. While concentration of duties in an EDP department makes internal control a sensitive audit problem, such problems can nevertheless be overcome through some degree of control being vested in the user department and control groups. The review of internal control by the auditor must, therefore, include both the computer and non-computer aspects of the system.

Having asserted that the evaluation of internal control is important to any audit, and especially one involving EDP systems, there appears to be a consensus²⁷ as to the types of control on which a sound EDP system would function. In broad terms these controls can be classified as:

— 'Organisational controls', encompassing administrative and systems development controls.

— 'Procedural controls', covering input, processing, output and master file controls.

The specific requirements and elements of control within these categories have received wide coverage in the literature and pronouncements of the professional accounting bodies throughout the world. The reader is referred to the more than adequate coverage readily available.²⁸

The criteria by which the auditor determines the extent to which internal controls have met the required professional standards²⁹ have not altered greatly with the introduction of EDP systems, although the content of his review has.

The basic documentation which must be maintained by an organisation and be accessible to the auditor for his evaluation of the system of internal control includes:

1. Flowcharts of the EDP organisation so as to distinguish the extent to which responsibilities are divided between individuals. Organisation charts for a medium and a large data processing department are presented in Appendix A.
2. Flowcharts of the processing system which can be classified either as systems flowcharts or as program flowcharts. A program narrative may be substituted for a program flowchart, although system maintenance requires full detail which cannot be provided by a narrative. A program flowchart is therefore preferable. Examples of a systems flowchart, program narrative and program flowchart can be found in Appendix B.
3. Organisation charts and operations manuals which contain information on established organisational and procedural controls within the DP department and the firm as a whole. These documents assist the auditor in obtaining a description of internal operations.
4. Listings and samples of reports generated by the system which provide a means of selecting the output information most suitable to the particular audit.

Combined with using this documentary evidence effectively is of course evidence gained from interviews with user and DP personnel, as well as the

²⁴AICPA Task Force, 'Advanced EDP Systems and the Auditor's Concerns', *Journal of Accountancy*, January 1975.

²⁵This may not always be the case. The problem can be overcome by the introduction of control through user department and control section involvement.

²⁶R. A. McLaughlin, *op. cit.*

²⁷F. Brown, 'Auditing Control and System Design', *Journal of Systems Management*, April 1975; S. C. Corwin, 'Audit Control in an EDP Environment', *Federal Accountant*, March 1974; G. Hollis, 'Data Processing and the Auditor', *Computer Bulletin*, January 1972; W. S. Boutell, *Contemporary Auditing*, California, Dickenson Publishing Company, 1970; G. B. Davis, *Auditing and EDP*, New York, AICPA, 1968; W. T. Porter, *EDP Controls and Auditing*, California, Wadsworth Publishing Company, 1974.

²⁸A more detailed coverage of these types of controls can be found in Technical Bulletin, F.2, *op. cit.*, and Technical Bulletin, F.3, 'The Audit of Computer-Based Accounting Systems', issued by the Institute of Chartered Accountants in Australia; Statements on Auditing, U14, *op. cit.*, and Statements on Auditing, U15, 'The Audit of Computer-based Accounting Systems', issued by the Institute of Chartered Accountants in England and Wales. See also the material referred to in footnote 27.

²⁹*ibid.*

auditor's internal control questionnaire. Many examples of the latter are available.³⁰ The effective use of the observation of machine runs and a review of data, will provide a sound basis for the initial internal control evaluation.

One of the main areas of concern at this stage of an audit appears to be related to the level of EDP expertise of the auditor, and the difficulty of the EDP expert and the auditor in developing effective communications. There has been a failure to understand each other's constraints and viewpoint. The DP manager can regard the auditor as a burden at times when he is under considerable pressure from management to produce results. The auditor, on the other hand, is intent on reviewing and evaluating the system in order to achieve his audit objectives with the least amount of manpower while maintaining the desired standard of audit. Each group has its own technical language and objectives. The literature tends to support the notion that, really, both groups are compatible.³¹ The DP manager and the auditor will both be better served if the system is designed in such a way as to provide efficient and controlled performance. Good systems are just as beneficial to management as they are important to the auditor. The costs of locating and correcting errors and bugs in a system are probably greater than costs arising from deliberate fraud.

If the auditor and the DP professional are to work together to ensure that the client's systems are sound, it is suggested that:

1. The audit profession provide facilities whereby auditors are sufficiently educated and kept up to date with advances in data processing practice, and
2. The auditor be directly involved in the design and implementation of his client's computer-based system.

Each group must, of course, express itself in less technical language if effective communication is to be achieved. In this way, both parties can combine to ensure that the system is sound, thereby providing benefit to both parties in the attainment of their objectives. Auditor-DP manager cooperation may be especially relevant with the growing use of data base concepts, where control will be even more important and more difficult to implement and review.

³⁰Examples of these types of Internal Control Questionnaires can be found in G. B. Davis, *op. cit.*, Technical Bulletin F.3, *ibid*, appendix 3, Statements on Auditing Standards, U15, *ibid*, and J. J. Wasserman, 'Audit Questionnaires for Computer Libraries and Back-up', *Internal Auditor*, March/April 1973.

³¹G. Hollis, *op. cit.* and P. Morriss, 'How Computer Auditors Approach their Work', *Computer Weekly*, 16 August 1973.

A major cause of friction between DP personnel and auditors arises over the question of the auditor obtaining computer time for the processing of test decks, the running of computer audit programs or the extraction of information from master files. If this problem is to be overcome, it is necessary for the auditor and the DP manager to reach a mutually acceptable arrangement early in the audit as to either the availability of computer time on the in-house computer, or the use of suitable outside facilities, the cost of which will be borne by the client.

Another major problem encountered by auditors is the insufficiency of supporting documentation for programs and systems. Again, this problem can be overcome if the system is developed and implemented in a way that ensures adequate control and supervision over the preparation and updating of documentation. The client firm would benefit, with the auditor, as a result, since adequate documentation for continuing systems and programs is vital with changing DP personnel. That is, documentation provides a convenient reference for systems analysts and programmers responsible for maintaining existing systems and programs – the lack of such documentation leads to a time consuming and costly reconstruction. In practice, however, the updating of documentation after every minor change is time-consuming for the analysts and programmers responsible. The tendency is for brief, informal documentation which, although incomprehensible to the auditor, may be adequate for the DP people. That is, EDP management may take a calculated risk on staff leaving. If the auditor has strong influence with top management of the client firm, he may be able to generate action for improvements in internal systems in cases where the DP manager has previously failed to gain approval for such action. In this situation, the degree of auditor-DP manager cooperation required will be more likely to develop. This will of course be a function of the auditor's DP expertise.

Having evaluated the system of internal control in order both to isolate any areas of weakness which will affect the audit procedures to follow, and to be assured that errors and irregularities in the system will be discovered with reasonable promptness, the next function of any auditor is to test the system to determine whether in fact it is operating as specified. This will then provide a basis for an evaluation of the information produced by the system.

Audit software

Test decks and ITF facilities are means by which the auditor tests the operation of a system, but the

area of greatest development in the audit of EDP systems over the last decade is the Generalised Computer Audit Program (GCAP). Such packages perform functions related to audit tests on the operation of the computer system and procedural internal controls, as well as tests on the validity of large volumes of accounting data held on computerised ledger account files. The validation function is performed through the GCAP's ability to read files in a way that extracts information required for subsequent audit work, and to perform audit work on the content of files. This validation function represents the major use of GCAPs.

The development of GCAPs has emerged from a realisation of the advantages which can be gained through using the computer itself as an audit tool. There is opportunity to increase the scope of the audit, utilise the speed and accuracy of the computer and increase the level of confidence – all without necessarily increasing the audit time. The development of this line of thought can be seen in the proliferation of the GCAP technique.³² These programs have generally been developed by computer manufacturers and the larger professional accounting firms throughout the world. (During the 1960s there emerged several packages of generalised audit routines to be used on a specific set of compatible computers.) The reasons advanced for the design of GCAPs are summarised as follows:

- to facilitate access to information generated and stored within the computer.
- to utilise the speed and accuracy of the computer and reduce the need for clerical analysis.
- to facilitate the performance of major audit functions.
- to improve the range of analytical techniques available.
- to minimise the requirement for auditors to be complete computer technical experts.
- to provide a workable alternative to auditing 'around the computer'.
- to provide computer-based audit independence, so that the auditor is not reliant upon the client's personnel and expertise to look inside the computer files.

Computer audit functions performed by GCAPs are programmed models of manual auditing procedures adapted to the new environment of computerised systems. GCAPs appear to be widely used and accepted. There have been several surveys outlining

their characteristics and design features.^{33,34,35} The proliferation of GCAP packages, while signifying the acceptance of this audit technique, has however provided some concern and criticism. Criticism is levelled at the diversity of development, where considerable resources have been inefficiently applied by developers 'going it alone'³⁶ rather than combining efforts to produce a standardised approach to computer audit packages. A standardised approach does not imply adherence to an inflexible standard: rather it suggests a consistent approach involving the pooling of ideas and manpower to achieve a professional standard. The present deluge of GCAPs makes it extremely difficult for auditors (both internal and external) to evaluate and select the particular package most suited to their needs.³⁷ A standardised approach which is capable of adaptation to given situations by the application of independent professional judgement is surely more beneficial to auditing than the existence of numerous individual packages, many of which perform identical functions.

³³W. T. Porter, *op. cit.*, ch. 8; G. B. Davis, *op. cit.*, ch. 12. The basic elements of these programs, as revealed by surveys, are summarised in footnote 34. To determine the type and scope of functions performed by each different GCAP, and the particular machinery on which it can be run, it is necessary to contact the program manufacturers who are listed in the articles referred to in footnote 35.

³⁴Characteristics and design features of GCAPs are:

1. Selecting items from a file, e.g. selecting items which are greater, equal or less than a specified amount.
2. Performing mathematical functions.
3. Summarising or analysing a file, combining like detail records based on a specified field.
4. Comparing a number of different input files, and if required, merging some or all of the records.
5. Selecting and printing detailed reports on tests for checking, which can be generated and printed in various formats.
6. Resorting files into a different order.
7. Statistical sampling, where a pure statistical sample is selected for checking.
8. Selecting and printing file and confirmation outputs. This involves writing file information on magnetic tapes etc. for subsequent processing, or preparing all types of audit confirmation requests, i.e. requests from the auditor to third parties asking them to confirm certain information contained in the financial records.

³⁵H. J. Will, 'Computer Based Auditing – Part 2', *Canadian Chartered Accountant*, March, 1972, pp. 32–35; D. L. Adams and J. F. Mullarky, 'A Survey of Audit Software', *Journal of Accountancy*, September 1972, pp. 39–66; J. J. Wasserman, 'Computer Audit Packages', *Data Management*, 10 September 1972, pp. 71–72; and H. D. Laurenson and W. E. Kuntz, *op. cit.* (this article includes an outline of the nature and uses of the Auditape program).

³⁶M. R. Moore, 'Advanced Computer Auditing in the Seventies', *CPA Journal*, September 1972; and M. R. Moore, 'Preparing for Computer Auditing in the Seventies', *South African Chartered Accountant*, October 1972.

³⁷D. L. Adams and J. F. Mullarky, *op. cit.* This article provides some guidelines for selecting a GCAP that will meet the requirements of the auditor and the particular audit. There is a consideration of seventeen GCAPs.

³²H. J. Will, 'Audit Command Language', *Canadian Journal of Operational Research and Information Processing*, February 1975.

One recent attempt to standardise the software to audit through the machine is the development of the Audit Command Language³⁸ (ACL). The criteria for the design of ACL were derived from an analysis of the large number of available GCAPs in relation to user requirements. The scope of ACL has since been extended to cover the audit of 'management information systems'. As a result, ACL has been devised to support the audit on various types of equipment of more sophisticated systems founded on random access bases. The development of this prototype is a first attempt to standardise the audit of computer based files and, given the paths along which computerised systems are developing, deserves further encouragement and research. If the various developers of GCAPs had initially combined their resources, they may have agreed on an ACL type of approach, rather than designing several individual, but similar packages in terms of functions performed. The basic features of GCAPs could have been standardised, but with scope for tailor-made variations to suit the individual user.

Given that GCAPs are at present in vogue in computer auditing, their advantages and shortcomings are worth listing. The main advantages put forward are:³⁹

1. The computer speed and accuracy achieved with use of the technique enables data to be examined far more efficiently than is possible under manual audit tests.
2. Once a package is established, its running costs are relatively low, and its time saving can offer considerable economies. It is generally cheaper than the cost of developing a special program for each application, and it avoids the long lead time required for special programs.
3. GCAPs probably represent the only practical method of scrutinising large volumes of data where a pure statistical sample is not appropriate.⁴⁰

³⁸H. J. Will, 'Audit Command Language', *Canadian Journal of Operational Research and Information Processing*, February 1975, pp. 99-111.

³⁹These advantages have been extracted from: D. L. Adams and J. F. Mullarky, *op. cit.*; A. D. Chambers, *op. cit.*; K. O. Dorricott, *op. cit.*; G. Hollis, *op. cit.*; J. J. Wasserman, *op. cit.*; H. J. Will, 'Computer Based Auditing - Part 1', *Canadian Chartered Accountant*, February, 1972, pp. 29-34; H. J. Will, 'Computer Based Auditing - Part 2', *Canadian Chartered Accountant*, March, 1972; and R. B. Gage, 'Audit Software', *Internal Auditor*, September/October, 1973.

⁴⁰An example of this situation is where a perusal of a large creditor's file is required. This perusal may require the extraction of large, irregular, old and debit balances from the listing. The GCAP could accomplish this by extracting all balances over \$10,000, balances outstanding for greater than two months etc.

4. A package may be used on successive engagements, and extensively within an engagement until file layouts and programs change.

5. A package can be flexible in that parameters (e.g. stated limits above which a print out of all balances is obtained) can be adjusted each time the program is run.

6. GCAPs are basically user-oriented, thereby limiting the auditor's need for specialist EDP knowledge beyond understanding how to apply the particular package.

7. An audit firm that has developed such a program can embody its own particular auditing approach, such as working paper requirements, and statistical sampling plan. In applying its specialised audit program, the firm is demonstrating to the client that it is capable of performing an up-to-date audit, and perhaps also gains some prestige within the profession and industry. This approach however encourages the 'go it alone' pattern of development.

8. Personalised programs often facilitate analysis that would be difficult to complete manually.

Of course, there are certain constraints associated with the use of GCAPs:⁴¹

1. Initial development and testing, or acquisition, of such packages can be costly.
2. Hardware and file constraints exist, and there may be limitations of the package itself. Most audit packages will only work on a limited range of computers, therefore the auditor may need several packages to cover his whole range of clients. If the client uses a non-standard method of storing information then the package will not work on that particular file.
3. A certain degree of expertise is required, with a need to spend time on the training of audit staff.
4. The problem exists of obtaining computer time to use the package, although it may be possible to use an outside computer. Some professional audit firms may, in fact, instal their own in-house systems.

5. Clients often modify their EDP systems, thereby requiring amendments to programs depending on the GCAP in use. If, however, such changes are minor, the cost of adjustment would be minimal.

Overall, it appears that GCAPs are at present widely used and gaining momentum with the passage of time. The constraints listed above are in many aspects superficial. The cost of GCAPs may be high, but many auditing firms perceive the benefits to be greater than the cost, as evidenced by the array of

⁴¹These constraints are summarised from the articles referred to in note 39.

GCAPs developed and in use. It may however, be possible to reduce this cost through a unified approach to future development, rather than the present situation where many individual packages have been developed, but which duplicate functions performed. This can also be applied to the training of audit staff.

With this diversity of available packages, an auditor contemplating the use of this technique who has not designed his own package, will need to evaluate the alternatives available. Some questions that will need to be asked are:

- (a) What computer application will be processed?
- (b) What computer resources are available to be used?
- (c) What level of DP expertise is available?
- (d) How readily available is the particular package, and what back up is provided?

Having decided on his requirements, a perusal of the characteristics of each package as previously outlined will give the auditor some idea as to which package will best suit his purpose.

Service centre produced records

A phenomenon that has emerged during the various phases of computer development is the processing of data by many businesses on other than in-house facilities. Many firms, while recognising the advantages to be obtained from EDP, either do not have the volume of data to justify the installation of a computer or, for various reasons, do not wish to allocate resources to the establishment of their own computer and DP departments. In this situation processing of their data can be achieved by either renting computer time, sharing computer facilities or using the facilities offered by computer service bureaux. Most service bureaux have standard program packages for a particular application (e.g. sales, receivables, payroll, etc.) which are designed, owned and controlled by the bureaux. It is also possible for a firm to have a program tailored for its own particular use, with the processing being performed by the bureau. It may be noted that, even in the case of a firm having a program drawn up to its specifications, the client has no direct influence over the organisational and processing controls within the bureau.

The availability and use of these bureau facilities will have certain implications for the auditor whose client is involved. If a client is having data processed through a bureau and the data being processed is regarded as having a material effect on the financial statements, then a review of the controls operative at the service centre is warranted.⁴² This review

should encompass controls over hardware, programs, program modifications, security, input and output data and programmed controls, much the same as a normal review of an in-house system. This, however, implies a double standard. In both a manual and 'in-house computer' environment, it is necessary to test the system by tracing transactions through that system following the initial control evaluation. The standard referred to above does not require transaction testing at the bureau if the client's controls over input and output are adequate, even though a substantial portion of the system is contained within a bureau. It would seem that such a practice would leave audits of businesses that use service bureaux open to criticism, and could even be described as a return to auditing 'around the computer'.

The major problem is the accessibility of the bureaux to the auditor. A service bureau usually has no obligation to open its files, records, programs, etc. to its own clients' auditors or, in fact, to the client. In the majority of cases, bureaux are unwilling to expose their records (particularly the details of their programs) for reasons of commercial security. A solution that is currently being expounded,⁴³ and in some cases practised, is for a service bureau which is processing data for a large number of clients to have its package reviewed and reported upon by one external auditor. For example, in the case of several firms in the one industry each having branches in several areas, and each directing data to a central processing bureau which processes the data under a standard bureau program, it would be feasible for one firm's auditors to audit the bureau for a period of say two years, after which the audit would be rotated to another firm's auditors. The auditor involved at any point of time issues a certificate to the auditors of the other firms involved. For such reports to be of full audit worth, the process must be an ongoing one. Further, the reports should deal with the scope of the review, the extent of compliance testing (if any), the time period covered by the review, and any comments on unsatisfactory elements of the system. Where one particular auditor is reviewing the procedural system operative at a bureau, on behalf of other auditors, the weight of reliance to be placed on the resulting report is a matter for separate consideration by each affected auditor. Each auditor must judge such a report against his separate audit of a client's own data input and output controls.

Generally speaking, if the auditor's client is using a service bureau that does not agree to the concept of

⁴²Statement on Auditing Standards (SAS) No. 1, *op. cit.*

⁴³P. D. Warner, 'Audits of Service-centre produced Records', *CPA Journal*, January 1975.

exposing its operations to the scrutiny of rotating auditors, then it is the client's obligation to attempt to secure access to the bureau for his auditor. If this is not possible, the auditor is left with an 'around the computer' approach and must exercise his judgement as to the effect on the audit and the content of his audit report.

Real-time, on-line, and data base systems

In the later generations of the evolution of the computer, more sophisticated on-line, real-time systems have emerged. These systems are characterised by the processing of transactions as they occur, with responses capable of being made on the spot. Generally, on-line systems involve the use of remote terminals connected to the central processing unit. Real-time refers to a system where the results of processing are available within a time period required to influence an action or decision being made. The system is organised so that it can accept input at any time, execute the appropriate program, obtain access to the required master files, and, if appropriate, update those files, and respond with the appropriate output immediately when requested.

A further development in data management is the 'data base'. This concept involves the combining of separate sets of files into one integrated set of files. This type of file system allows a transaction that would have affected several different sets of records to update the single integrated file and output reports in one process.

Again the evolution of these advanced systems has implications for the auditor. Historically, auditors have functioned on an 'after the fact' basis. But, as in all systems with integrated data flow and parallel processing, it is imperative from the auditor's viewpoint that programmed controls be introduced in parallel with design and development.

Programmed controls are carried out through a series of instructions within the program itself, and are designed to determine the validity of input transactions as they flow through the system. Without such controls, the auditor may find himself working in a situation which is difficult or impossible to audit, and difficult to change. Areas which appear to be of main concern to auditors of on-line systems are the unavailability of source documents, the diffusion of authorisation of input, the lack of or disappearance of an audit trail and the lack of control totals. Some suggested solutions to these problems are considered later.

Looking at the EDP auditing techniques employed in the past and in use at the present time we can

perhaps evaluate their future usefulness in application to the audit of the more advanced systems. It is no longer acceptable practice to limit the testing of transactions and balances to the conventional recalculation of file contents. The auditor needs to explore information in the client's data bank in order to foresee the effect on transactions data, of accounting methods adopted by the client. He also should understand the consequences of using the various programs in the client's model bank. For these reasons, auditing 'around the computer' has no standing as an audit technique in real-time systems and can be ignored without further comment.

The use of GCAPs in their present stage of development is also of dubious value in application to real-time systems. Audit software was originally developed when file processing was relatively basic, with each application having its own files and programs. Files were structured using either a random access method, or a sequential or indexed sequential file organisation, with magnetic tapes being restricted to the sequential file organisation. Consequently, audit software was designed to allow access to these file structures. With the emergence of more complex file structures which arose from the integration of files to eliminate data redundancies, currently available audit software could not provide file access.⁴⁴

Several possibilities have been advanced to overcome file access problems. One solution that would appear obvious is to modify existing audit software. To do this however, it is necessary to predict the future development trends of real-time systems in order to make GCAP modifications viable. In order to monitor such system developments and successfully adapt to them, there must be a high level of technical expertise and cooperation between auditors and DP personnel. These problems have not gone unnoticed. Both the computer and auditing professions are involved in research to overcome the difficulties. Computer manufacturers are currently involved in security research to protect the systems of future computer generations.⁴⁵ The auditing profession, through its development of GCAPs, ITF and ACL, is developing and adapting these techniques to deal with more advanced systems. This research by both groups provides the basis for co-operation and improved techniques to meet the problems of the more advanced EDP systems.

⁴⁴C. R. Litecky and R. Weber, 'The Demise of Generalized Audit Software Packages', *Journal of Accountancy*, November 1974.

⁴⁵C. Nottingham, *op. cit.*

The proposition that the auditor become directly involved in a client's system design to ensure that internal systems include specific audit functions is a sound one in theory. It provides the auditor with the opportunity to make a valuable contribution from a control standpoint, and would reduce the chance of an unauditable system being produced.⁴⁶ It suffers, however, from the constraints of expertise and prediction of future trends as mentioned in relation to software modification. In more advanced systems where a traditional audit approach is unsatisfactory, and where audit review during the design stage is essential, these difficulties must be overcome. There is, however, the problem of auditor independence. The implication here is that direct involvement in systems design may require the auditor to become involved in the client's decision-making processes. Such involvement is not consistent with audit independence, although acting in a purely advisory capacity is acceptable.⁴⁷

Regardless of how an accounting system is technologically based, a review of internal control is vital to its effective audit. This review stage of the audit is perhaps of greatest current concern in relation to advanced computer-based systems. Nevertheless, the general approach should be much the same as that considered previously, namely – a general review of organisational and operational controls within the EDP accounting system. The detail will, of necessity, be more complex and concentrated on evaluating controls related to recovery from failures and emergencies, control over data submission and transmission, terminal usage and accessibility, and file back-up procedures. Types of control required in advanced systems have been summarised into five basic categories.⁴⁸ These are:

1. General environmental controls over the entire system. The main provisions for control here are:

- (i) Memory protection facilities and control over the instructions to the software system.

- (ii) Console log, indicating the loading of programs and detecting machine faults, thereby recording an audit trail of internal activities.

- (iii) History log providing a copy of all messages received and sent, which is useful in recovery from breakdown, and detecting any attempts to break the security system.

For overall control, the auditor needs to ensure that the controls are adequate in respect of documentation of start up and shut down of the system, console and control terminal operations, and any status change. Adequate documentation is essential to control the communication to the software system, and to control unauthorised use and storage.

2. Controls for recovering from emergencies and contingencies. These controls are necessary to prevent the loss of data from a failure of the system, and to restore operations. Requirements include back-up facilities and the means of effectively controlling messages received and not processed.⁴⁹

3. Message and terminal controls over transmission of data. These controls perform a function required in all systems – namely, to ensure all data transmitted is complete and accurate. In on-line systems, this includes the control of terminal usage and security. The basic elements of a system security are the use of special passwords and authority lists, with the software being able to determine if the proper authorisation for certain transactions is operative.

4. Data base controls cover the need to ensure only authorised access to data files. Procedures generally involve control over data access from remote terminals through the use of passwords. Where files contain confidential information, access requires the use of a password system containing several levels of information.

5. Processing controls encompass much the same elements as apply to less advanced computer systems. For example, the requirement of an audit trail remains an important element. Perhaps the maintenance of a transaction register could be incorporated to supply printed audit trails when requested.

It is clear that the development of more sophisticated computer-based accounting will increasingly

⁴⁶AICPA Task Force, *op. cit.*

⁴⁷'The rendering of management, taxation, share registry or accounting services to a client does not in itself impair a member's independence when acting as an auditor of that enterprise, provided the activities of the member are confined to the rendering of service, or the tendering of advice, and the member does not participate in decision making. The independence of a member acting as auditor will not be affected provided the other services he or his firm are rendering do not constitute the member or his firm a servant of the company.' B.12 'Independence', Ethical Rulings para. 7, issued by The Institute of Chartered Accountants in Australia.

⁴⁸W. T. Porter, *op. cit.*

⁴⁹Back-up facilities in this instance require the software system to be capable of accommodating different hardware environments. Once restart is successfully initiated, all terminals must be notified of the difficulties and informed of the last message and queued, along with the last message sent to the terminal. See W. T. Porter, *ibid*, p. 186.

tax the ability of the auditor to adapt. The fundamental task facing the auditor of any system is to ensure the system is functioning as laid down and that all controls are operative. Perhaps the use of the ITF facility will become prominent in this respect. As discussed earlier, the ITF concept appears to be adaptable to the on-line system, provided it can be applied frequently and as part of the regular operations. ITF provides a means to independently monitor a system. ACL may also prove to be a useful audit tool in this situation. But the promise of any particular audit technique is conditional upon the direction of future technological developments in computer-based systems.

Education

As a result of the pace of change in data processing technology to date, concern has arisen over the competence of auditors in terms of EDP expertise. It is important that the auditor understand EDP techniques so that he can effectively evaluate the internal control system and, if required, utilise the computer during the audit. A survey conducted in 1966⁵⁰ revealed that 34% of Canada's largest companies were dissatisfied with the level of computer knowledge displayed by their auditors. It would be interesting to review the results of such a survey in today's EDP environment. While not every auditor need be an EDP expert, it would be desirable for each audit firm to have some staff with a degree of specialisation in this area, although the creation of a specialist image tends to create the incorrect impression that computer auditing is not an integral part of an audit.⁵¹ In any event the particular audit being performed will determine the level of proficiency required.⁵²

In Australia and the UK at present, emphasis would seem to be directed toward educating the general auditor to the DP environment, thus narrowing the gap between the DP specialist and the auditor. This is evidenced by the large number of Professional Development courses and conferences held by the professional accounting bodies, and the individual firm training courses on EDP Auditing. This does not imply that the DP specialist is no longer required to supervise the audit firm's DP

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section or develop and operate the more complex techniques that will be required in the future.⁵³

Conclusions

EDP based systems have created important new challenges for the auditing profession, and will continue to do so as new computer technology evolves. Adaptation of auditing techniques to the changing media of data processing has been relatively gradual and belated. The area is one requiring greater concentration of research effort than has been evident in the past.

As a result of a survey that IBM conducted among some leading accounting firms and societies, eleven basic problems encountered by auditors in regard to EDP have been identified.⁵⁴ These problems are summarised below:

- (a) The difficulty of staying up-to-date on EDP technology and of assessing the audit impact.
- (b) User personnel and auditors who do not understand DP technology.
- (c) Insufficient documentation in support of systems and programs.
- (d) Too much concentration of responsibility and control in the EDP department, with the consequent dilution in internal control.
- (e) Loss of an audit trail.
- (f) Lack of source documents.
- (g) More sophisticated computer applications with interactions between systems being more complex.
- (h) More relaxed controls in manual applications.
- (i) Lack of accuracy in the control over rejected data.
- (j) Control over program changes.
- (k) Auditors determining what should be retained as evidential matter because of the vast amount of data.

Such basic practical problems will be accentuated in the future unless, at the work-place level, auditors and DP personnel interact in a more positive fashion and, at the administrative level, the auditing profession takes a more dynamic and unified stand in its approach to EDP auditing.

The problems of improving auditor education, and DP/auditor interaction, are complementary. One approach to this dual problem is to present combined courses for auditing (internal and external) and

⁵⁰G. B. Davis, *op. cit.*, p. 231.

⁵¹R. S. Lynn, *op. cit.*

⁵²G. B. Davis, *op. cit.*, p. 232. Davis presents a table indicating the level of expertise required for various EDP systems.

⁵³The narrowing of the gap between the general auditor and the DP specialist may explain the trend toward the decline in specialisation in the UK although C. Burn, 'Auditing the Computer', *Accountant*, January 1975, advances other reasons for this trend.

⁵⁴E. B. Levine, 'Auditing Requirements for Advanced Systems', *Journal of Accountancy*, March 1974.

computer personnel. Through co-operative activities of the auditing and computer societies, courses and seminars could be arranged so as to provide a forum for the exchange of problems and ideas. The aim should be to provide a basis for a greater understanding of each others' point of view. Any such educational process must be continuous so as to keep all parties informed of the latest developments within the respective professions. While this process may not eliminate specific 'on the job' confrontations, the foundation will be laid for improving cooperation. One positive suggestion for improving working relationships is for the internal audit group to be encouraged to act as arbitrator between external auditors and the DP department.

For more advanced systems, it will be necessary that auditing and computer field work guidelines for auditors be revised so that members of both professions accept the specification of the elements of sound internal control systems. Moreover, there must be greater acceptance of the fact that auditors are to be directly involved in the development and subsequent change of the client's computer applications. At the administrative level, the auditing bodies have a responsibility to initiate inquiry into the adequacy of

presently available computer audit techniques, and to encourage research into ways of coping with the inevitable advances in DP technology. If this is not done, auditing practices are likely to become increasingly unsuitable, with possible consequences of a general decline in professional status.

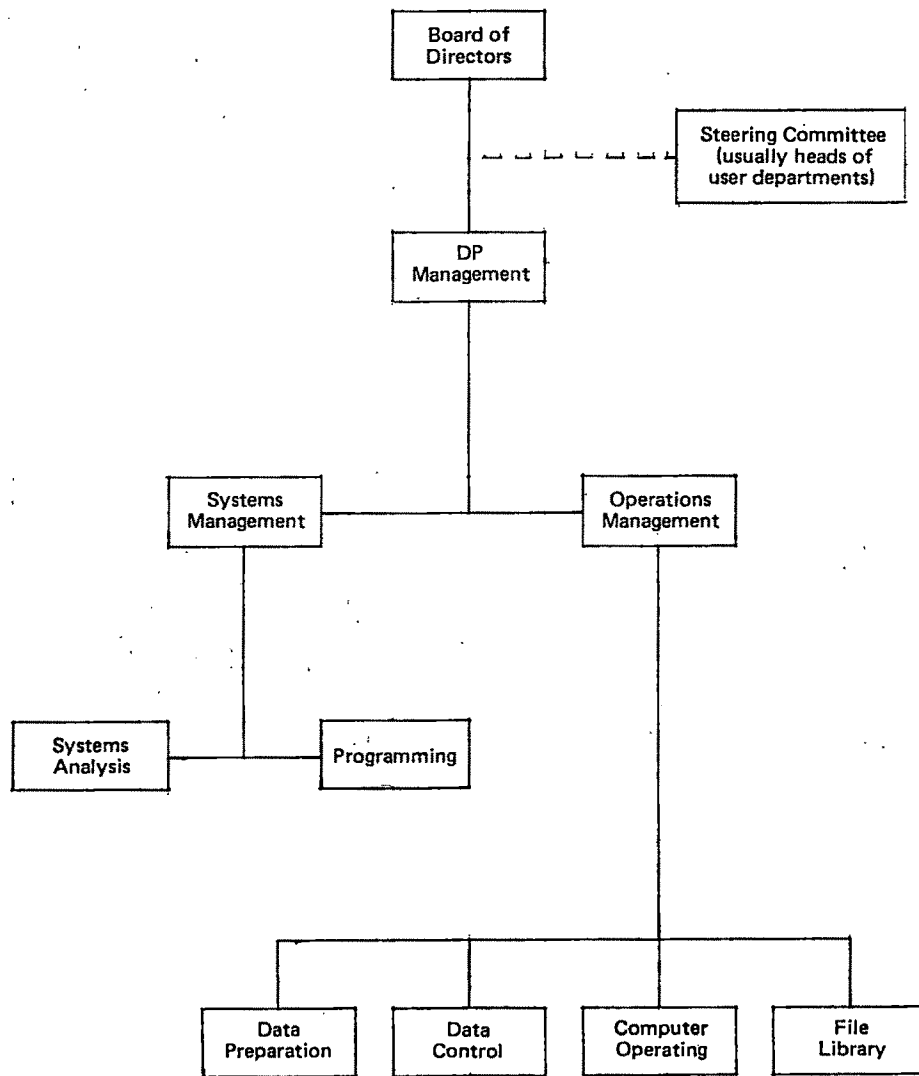
To meet the demands of the future there must be some strategy for retaining the services of EDP specialists within the auditing profession, and for rationalising the future development of computer audit techniques. The incidence of individual firms working alone should be reduced with greater emphasis on the profession as a whole combining its efforts toward the common end of maintaining a high quality of auditing in a changing environment.

Acknowledgement

The author wishes to acknowledge the helpful comments of his colleagues in the Department of Accounting and Finance, Monash University, D. V. A. Campbell, W. P. Day and D. W. Taylor, on the drafts of this article.

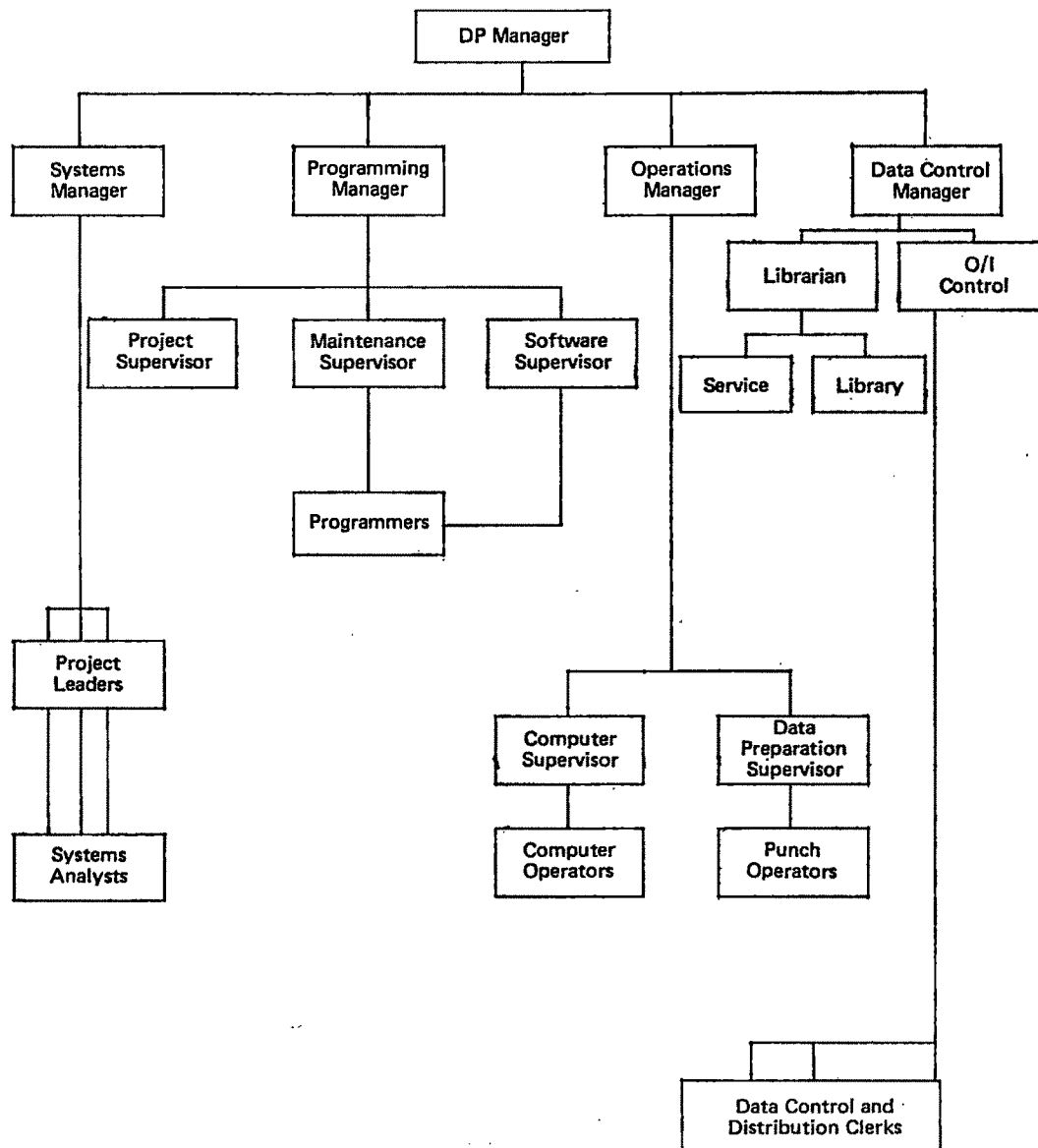
APPENDIX A

Flowchart for a medium sized EDP department



In a larger EDP installation the management structure could be extended to incorporate a programming manager and a data manager to divisionalise responsibilities further.

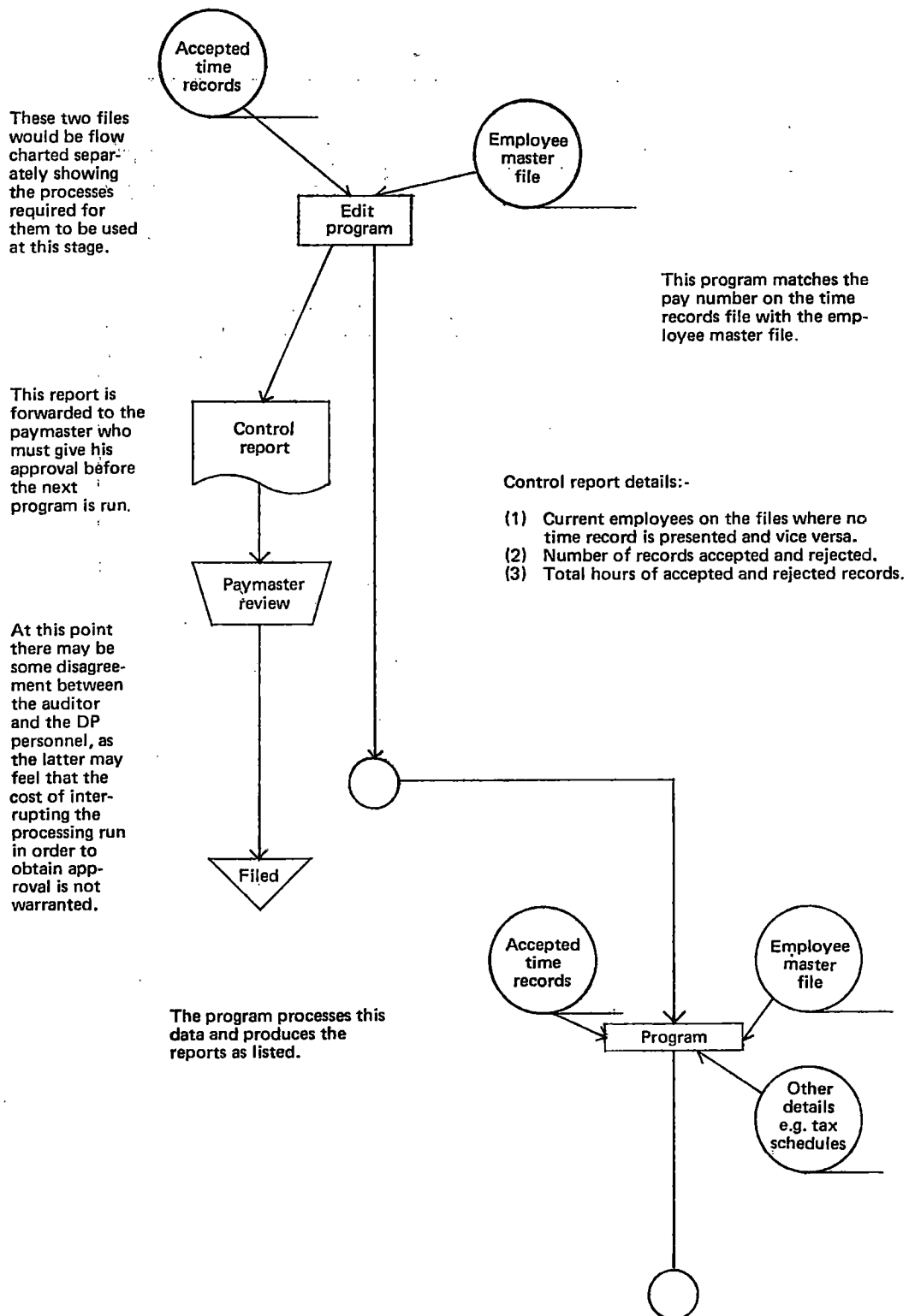
Typical organisational structure of a large EDP department
(see ICAA/ASA Technical Bulletin F.2, 1976).

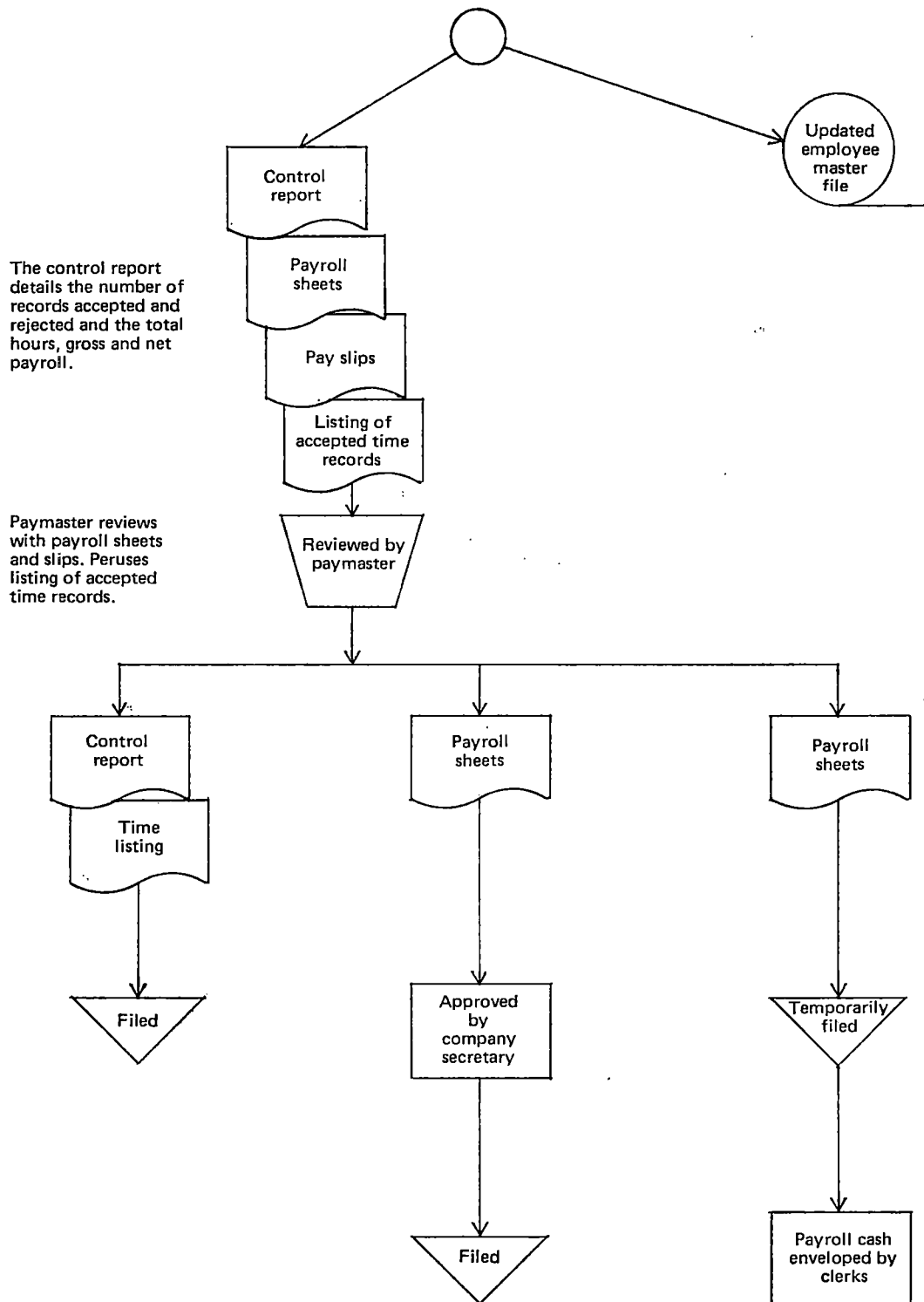


This structure would be ideal.
The size of the installation however determines the extent to which this is possible.

APPENDIX B

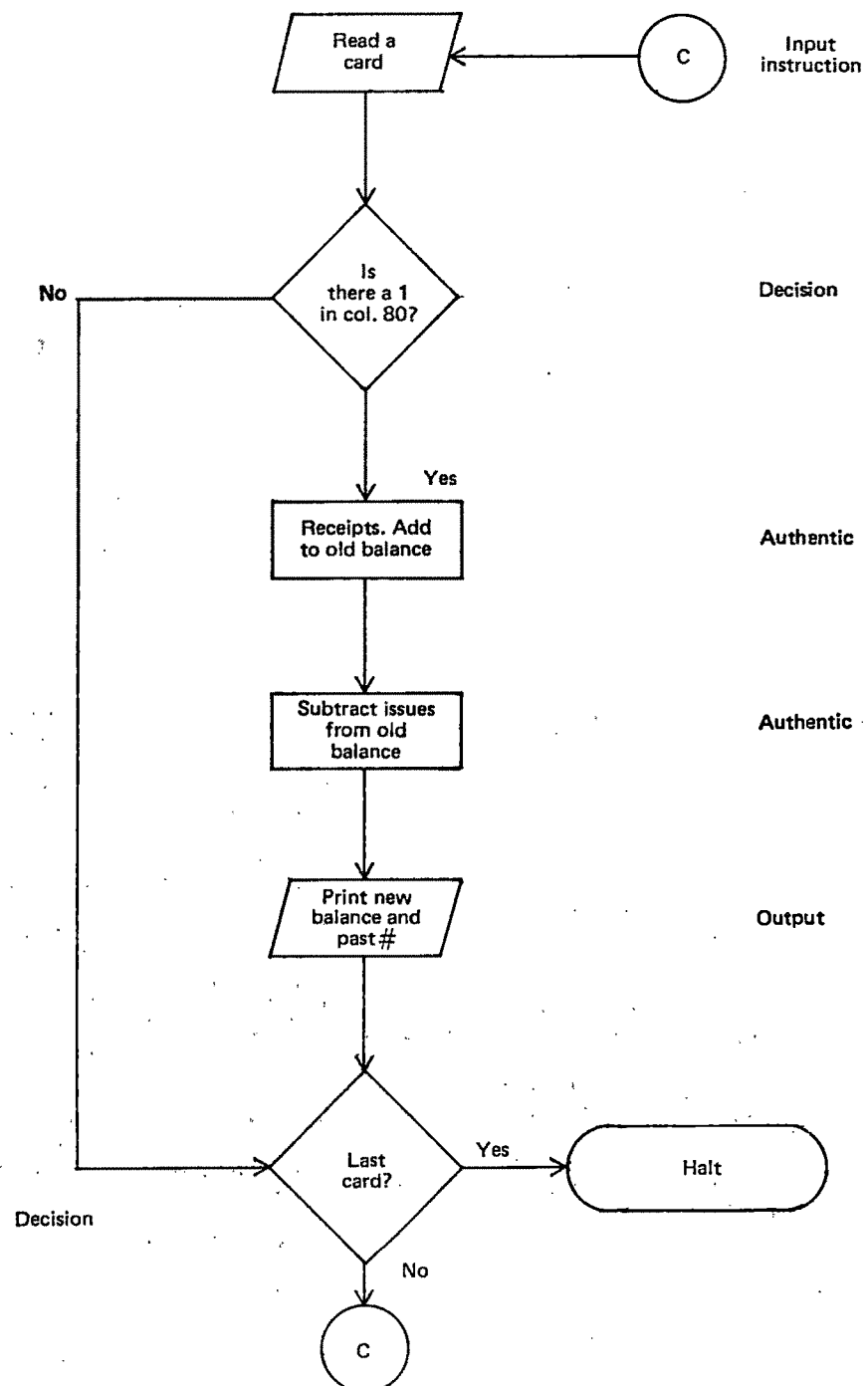
System flowchart suggested for the processing of a weekly payroll.





Program flowchart for a card inset with each card containing five data fields: - part number, old balance, receipts, issues and flag code (in column 80 of card).

The computer process consists of reading the card input, testing the flag field for a 1, computing $\text{new balance} = \text{old balance} + \text{receipts} - \text{issues}$, and printing the contents of the updated record for those cards with a 1 in the flag field.



Program narrative of the program referred to on the system flowchart.

The program flowcharts (or narrative) describe in detail and in proper sequence, the operations and decisions involved in the particular program. e.g. Program narrative of compile program on systems flowchart.

X.Y. Ltd.

5/8/75

Payroll System

Compile weekly payroll

Analyst P.D.G.

AIM To prepare the weekly payroll sheets

INPUT Accepted time records tape
Employee master file, updated

OUTPUT Control report
Weekly payroll sheets
Pay slips
Updated employee master file
Accepted time records listing

PROCESSING

- Match time records for each employee with details on employee master file to produce weekly payroll.
- Update employee master file with details of weekly payroll.
- Accumulate control totals required to produce control report.
- Print accepted time records listing.

On a more detailed narrative, e.g. for an edit program on master file changes, it may provide such details as: perusing to ensure number not already on file, ensuring all fields are in format as specified (i.e. numeric, binary), ensure each record complies with various codes required (e.g. tax code between 002 and 019).

Appendix C

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Holding Gains on Long-Term Liabilities - an Alternative Analysis

John R. Grinyer

Introduction

This paper is written in the belief that information concerning the estimated creation of wealth, measured in real terms, by past *completed* transactions may be of use in making economic decisions. In some ways it is 'placing the cart before the horse' to publish it before having fully supported the above stated belief by rigorous argument. An analysis attempting to provide such support is in the course of preparation during the final revisions to this paper, but the fact that this contribution is part of a continuing debate prompts the writer to publish now, despite the fact that the sequence of presentation would otherwise be inappropriate.

The accounting model which the author has in mind can be defined as follows: $P_{rt} = R_{rt} - C_{rt} - O_{rt}$ where P_{rt} is real profit in period t

R_{rt} is proceeds of sale of goods or services in period t , expressed in real terms (e.g. CPP)

C_{rt} is the sum of the cash outlays which can be identified as being incurred to enable the period's sales (R_{rt}) to be achieved, i.e. the historical costs which can be specifically 'matched' with identifiable sales transactions, expressed in real (e.g. CPP) terms. Joint costs associated with the sales transactions of several reporting periods, e.g. costs of plant or financing, are matched by reference to the pattern of net revenue expected to be derived from the resource being consumed.

O_{rt} is the sum of outlays, during the period, which cannot be 'matched' with any specific element of period or future revenue, again expressed in real (e.g. CPP) terms. These can be considered to be the overhead costs of remaining in business.

Considerable argument is possible over the basis on which one identifies the cash outlays underlying C_{rt} , and judgement would be required in this

'matching'¹ process. It is beyond the scope of this paper to discuss generally such matters, as we consider only the question of financing flows. In the latter connection it may, however, be helpful to remember that the outflows associated with a financing transaction usually arise because of a need to acquire physical or monetary assets necessary for the generation of sales transactions. Such outflows therefore need to be 'matched' against the relevant revenue. Under Historical Cost Accounting this procedure would typically generate the expense items shown as depreciation and interest. Such a classification is, however, merely a way of assigning the total costs, including financing outlays, to sales transactions.² This may need some clarification, which is best provided by way of a simple example, as follows:

We borrow £2,000 for two years at 20% p.a., to finance the purchase of a machine costing £2,000. The cash flows associated with the combined transactions are:

	Year 0	Year 1	Year 2
Loan	+2,000	- 400	- 2,400
Machine	-2,000		
	<hr/>	<hr/>	<hr/>
Combined cash flow	-	- 400	- 2,400
	<hr/>	<hr/>	<hr/>

If the combined cash flows are adjusted for general inflation, we obtain the specific costs in real terms.³

¹The term 'matching' is used in both an accounting and a banking sense during the paper. Obviously the uses have very different implications.

²It is recognised that the capital cost of equipment financed from equity funds is not a complete reflection of the shareholders' opportunity cost. That is, however, an issue outside the scope of this paper.

³The use of specific costs appears to ignore the possibility of imputed costs, to shareholders, arising from the market's reactions to gearing. Such costs should only arise because of changes in discount rates consequent on changed perceptions of risk. It can, therefore, be argued that it would be inappropriate to include them in the figures to be used as a basis for forecasting the flows which will be discounted by the analyst at the rate appropriate to the level of gearing adopted by the firm. Such an argument seems appropriate to forecasts in both cash and real terms.

Part of those costs are written off as depreciation, part as interest and (under most systems of CPP accounting) part is shown in the profit and loss account as an inflation-generated gain on liabilities. The purpose of this paper is to discuss how the inflation-adjusted combined flows should be matched against revenue, on the assumption that the matching process should ideally apportion 'real' costs by reference to the 'real' income derived by the use of the resources (e.g. the machine) obtained. Naturally the example oversimplifies the issue, because sources of finance are not usually linked with specific assets.

In this paper, then, we consider available alternatives for the accounting 'matching' process. If we can identify the assumptions underlying each alternative, we have a basis on which to exercise informed judgement. Under CPP methods, the inflation-generated gain on monetary liabilities is the item of information usually used to adjust the other figures relating to finance, so we will use a discussion of that topic as the vehicle for our analysis.

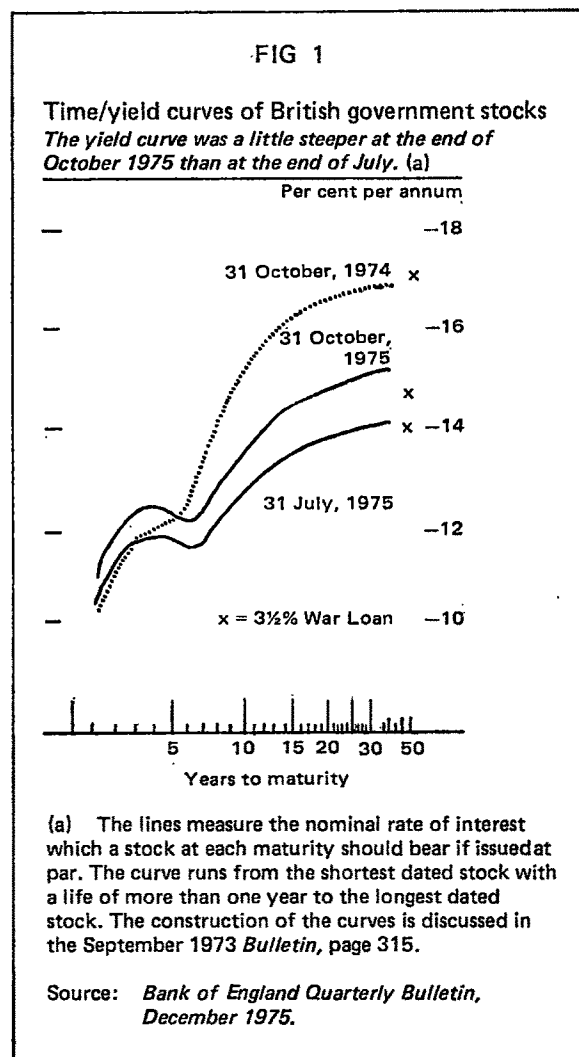
It has been shown,⁴ under an assumption of constant rates of real interest in respect of each borrowing transaction, that the assumptions necessary for the generally advocated procedure for calculating holding gains on long term liabilities to be valid under the conventional model outlined above are unrealistic. This paper presents an alternative analysis based on the money rates implied by the term structure and discusses the relative merits of the measurement approaches which derive from the alternatives. Issues raised by Egginton and Morris (EM) will be considered as appropriate.

The term structure and financing costs

There is an extensive literature on the reasons for the term structure of interest rates, in which supporters of the different schools present contrary arguments based on hypotheses of investor behaviour and analyses of empirical data. This paper will not enter that debate because, for our purposes, it is sufficient to observe that the term structure exists. Figure 1 shows some term structures, and it will be

observed that the term rates are a positive function of time for most periods.⁵

Although each term interest rate is expressed as a constant annual figure, it could be considered to be a weighted average of annual rates.⁶ This can most simply be illustrated assuming no transactions costs and a contract which specifies a single payment of cash at the terminal date, annual interest charges being loaned to the firm at a contractual rate set by



⁴J. R. Grinyer, 'Holding Gains on Long-Term Liabilities. A Rigorous Analysis', *Accounting and Business Research*, Autumn 1975. That paper has been challenged, during the course of preparation of the current one, by D. A. Egginton and R. C. Morris in 'Holding Gains on Long-Term Liabilities: A Comment', *Accounting and Business Research*, Summer 1976. Reference will be made to the comment using the abbreviation EM.

⁵The Bank of England has now altered the basis of calculating the curve, with effect from June 1976, to remove the kink which is claimed to have been an anomaly resulting from the method of computation. See O. Page and J. P. Burman, 'Yield Curves for Gilt Edged Stocks: a Further Modification', *Bank of England Quarterly Bulletin*, June 1976.

⁶This comment does not lead us into the debate on the causes of the term structure. Management is assumed to be able to choose the term of a loan which it obtains. Comparison between the interest rates for different terms then enables us to calculate a figure of effective interest rate for each year. We are concerned with alternative costs and not market causes.

reference to the term structure at the time of the loan. Under such circumstances the term rate R_{tn} could be considered to be an average of annual rates r_{ti} , as shown⁷ in Equation 1.

$$R_{tn} = \left(\prod_{i=1}^n (1 + r_{ti}) \right)^{\frac{1}{n}} - 1 \quad \text{Eq. 1}$$

n
where \prod indicates that the following terms are to
 $i=1$ be multiplied n times with i taking
successive integer values from 1 to n
 t is the time of the loan contract
 n is the term of the loan
 r_{ti} is the rate implied for the year $t+i$ by
the term structure at time t
and R_{tn} is the stated annual rate of interest at
time t for a loan with a term of n periods.

This model enables the implied annual rates to be calculated by reference to the term structure observed on the market at the time of entering the contract, i.e. at time t , for both rates R_{tn} and R_{tn-1} are then known, i.e.,

$$\begin{aligned} (1 + R_{tn-1})^{n-1} &= \prod_{i=1}^{n-1} (1 + r_{ti}) \\ \text{and } (1 + R_{tn})^n &= \prod_{i=1}^n (1 + r_{ti}) \\ \text{so } \frac{(1 + R_{tn})^n}{(1 + R_{tn-1})^{n-1}} &= 1 + r_{tn} \\ \text{and } r_{tn} &= \frac{(1 + R_{tn})^n}{(1 + R_{tn-1})^{n-1}} - 1 \quad \text{Eq. 2} \end{aligned}$$

As n can be defined as any number ≥ 1 , the rates for all periods can be determined. Unfortunately the necessary assumption that intermediate interest payments are re-invested forward at the period rates implied by the analysis is unrealistic. The model is, however, frequently adopted in the literature of the term structure⁸ and is used as a

⁷Equation 1 is derived from the assumption that R_{tn} is the rate which discounts the expected terminal value of the loan to the initial amount lent, i.e.

$$0 = \frac{\prod_{i=1}^n (1 + r_{ti})}{(1 + R_{tn})^n} - 1$$

⁸For example it is to be found, in different terms, in C. R. Nelson, *The Term Structure of Interest Rates*, Basic Books Inc, 1972; E. F. Fama and M. H. Miller, *The Theory of Finance*, Holt, Rinehart and Winston, Inc., 1972; and J. Van Horne, *Function and Analysis of Capital Market Rates*, Prentice-Hall, 1970.

basis of analysis in this paper because it seems to be the one which most fully identifies relevant variables whilst retaining a form which enables generalisation of the problem of holding gains on long term liabilities. Appendix 1 shows the approximate rates derived using equation 2 and the term structure at the end of October 1975 as shown in Figure 1.

A more adequate description of the borrowing transaction would recognise the payment of interest before the terminal date of the loan, for example as in Equation 3, which shows the position with repayment of principal at the terminal date under an assumption of issue and redemption at par.

$$1 = \sum_{j=1}^n \frac{R_{tn}}{\prod_{i=1}^j (1 + r_{ti})} + \frac{1}{\prod_{i=1}^n (1 + r_{ti})} \quad \text{Eq. 3}$$

Using this equation the rates r_{ti} can be calculated from market data by starting from a single period loan and then extending the analysis by one period at a time, as shown in Appendix 2. Thus the period rates implicit in a term loan can be estimated in a manner which has regard to cash flows and makes no re-investment assumption.

A further way of calculating the effective annual rate of interest is to accept an iterative procedure which calculates rates in successive years on the basis of the principal outstanding at the commencement of each year, taking account of effective rates in earlier years and the repayments inherent in the term structure. The rates applying under such an approach could be calculated as follows:

$$\begin{aligned} r_{t1} &= \frac{1 + R_{t1}}{1} - 1 \\ r_{t2} &= \frac{1 + R_{t2}}{1 + r_{t1} - R_{t2}} - 1 \\ r_{t3} &= \frac{1 + R_{t3}}{(1 + r_{t1} - R_{t3})(1 + r_{t2}) - R_{t3}} - 1 \\ \text{etc.} \end{aligned} \quad \text{Eqs. 3a}$$

A comparison of the rates derived under the three models is to be found in Appendix 2. The rate r_{ti} in Equation 3 is logically equivalent to the r_{ti} derived from equations 3a and, as expected, the methods shown in these equations yield identical rates. The pattern of such rates is the same as is derived under equation 2, but the movements are more pronounced. Under both equations 3 and 3a, because R_{tn} changes with the term, the definition of r_{ti} by reference to the members of the set R_t becomes increasingly

complex with the extension of the lending period and does not lead to a helpful general expression. Unrealistic algebraic analysis may be better than none, so we initially proceed on the assumptions underlying equations 1 and 2. We return to the more realistic world of equations 3 and 3a at a later point in the paper.

Returning to equation 2, and using B to denote the amount borrowed at the outset, the sum due in respect of the interest for year k , I_{tk} , is

$$I_{tk} = B(1 + R_{tk-1})^{k-1} r_{tk} \quad \text{Eq. 4}$$

and not $B(1 + R_{tn})^{k-1} R_{tn}$ as would typically be shown in historical cost accounts using the re-investment assumption of the model.⁹ Similar relationships exist for all other periods in the loan term. So far all values have been defined in money, so adjustment is needed to convert them to real terms.

Define the rate of inflation in period i as f_i and analyse in period t money values, then equation 2 becomes, for any period $t + k$,

$$\begin{aligned} r_{tka} &= \frac{(1 + R_{tk})^k \left(\prod_{i=1}^k (1 + f_i) \right)^{-1}}{(1 + R_{tk-1})^{k-1} \left(\prod_{i=1}^{k-1} (1 + f_i) \right)^{-1}} - 1 \\ &= \frac{(1 + R_{tk})^k (1 + f_k)^{-1}}{(1 + R_{tk-1})^{k-1}} - 1 \quad \text{Eq. 5} \end{aligned}$$

where r_{tka} is the real rate for period k set by reference to the original term structure and the actual rate of inflation. Thus, although the rate of future inflation is uncertain, the real rate of interest for any period is uniquely determined, under *this* model, by the market opportunities existing at the date of the original transaction and the rate of inflation during the period – which at the time of preparing accounts has already been measured. Similarly the amount of interest actually paid, in real terms at time t , is found as I_{tka} by altering Equation 4 to

$$I_{tka} = B \left[(1 + R_{tk-1})^{k-1} \left(\prod_{i=1}^{k-1} (1 + f_i) \right)^{-1} r_{tka} \right] \quad \text{Eq. 6}$$

⁹If the reader refers to equations 1 and 2 he will observe that $B(1 + R_{tk-1})^{k-1} = B \prod_{i=1}^{k-1} (1 + r_{ti})$, by definition.

Substitution of equation 5 into 6 yields

$$\begin{aligned} I_{tka} &= B(1 + R_{tk})^k \left(\prod_{i=1}^k (1 + f_i) \right)^{-1} \\ &\quad - B(1 + R_{tk-1})^{k-1} \left(\prod_{i=1}^{k-1} (1 + f_i) \right)^{-1} \quad \text{Eq. 6a} \end{aligned}$$

Note that Equations 6 and 6a are equivalent, and choice between them can be made entirely on the grounds of convenience. General inflation adjusted accounts will usually be expressed in terms of money values at the end of the accounting period, and equation 6a can readily be adjusted to current price

levels by multiplying it by $\prod_{i=1}^k (1 + f_i)$. Interest paid, expressed at the price level at the end of period k , would then be I_{tkc} in equation 6b, i.e.

$$I_{tkc} = B(1 + R_{tk})^k - B(1 + R_{tk-1})^{k-1} (1 + f_k) \quad \text{Eq. 6b}$$

The term structure and CPP

Under the CPP approach¹⁰ it is usually advocated that the net cost of debt (D_c), after holding gains, for period k be calculated as in equation 7:

$$D_c = P_{k-1} (R_{tn} - f_k) \quad \text{Eq. 7}$$

where P_{k-1} is the *money* contractual principal outstanding at the beginning of period k and other terms are as previously defined. Under the model we have been exploring, in which we assume that annual interest is re-invested in the firm to the terminal date at a constant interest rate of R_n , we can reason as follows:

$$P_{k-1} = B(1 + R_{tn})^{k-1}$$

so equation 7 becomes

$$D_c = B(1 + R_{tn})^{k-1} (R_{tn} - f_k) \quad \text{Eq. 7a}$$

Substitute R_{tn} for R_{tk} and R_{tk-1} in equation 6b and simplify, then

$$I_{tkc} = B(1 + R_{tn})^{k-1} (R_{tn} - f_k) \quad \text{Eq. 8}$$

¹⁰As outlined, for example, in the UK ASSC Provisional Statement of Standard Accounting Practice 7, and W. D. Bradford, 'Price-Level Restated Accounting and the Measurement of Inflation Gains and Losses', *Accounting Review*, April 1974.

But equations 7a and 8 are identical, so, under the assumption of constant annual rates equal to the term rate R_n , the conventional approach, shown in equation 7, gives the solution required by the outlined term structure model. Such an assumption would enable the usual CPP figures to be in agreement with a term structure approach without re-investment of interest payments¹¹, because then the principal outstanding would always be B in money terms, so real interest in period t prices would be

$$I_{tka} = (B + BR_{tn}) \left(\prod_{i=1}^k (1 + f_i) \right)^{-1} - B \left(\prod_{i=1}^{k-1} (1 + f_i) \right)^{-1}$$

and in prices at the end of year k

$$I_{tke} = (B + BR_{tn}) - B(1 + f_k) = B(R_{tn} - f_k)$$

which is the same as Equation 7.

Returning to our earlier model, we can generalise the difference between the real cost in year k and the accounting figures of 7a by deducting a re-formulation of that equation from 6b, yielding

$$I_{tke} - D_e = B[(1 + R_{tk})^k - (1 + f_k)(1 + R_{tk-1})^{k-1} - [(1 + R_{tn})^k - (1 + f_k)(1 + R_{tn})^{k-1}]]$$

Eq. 9

This difference can be calculated for any term structure and rate of inflation.

Consideration of Equation 9 indicates that, under the model defined in 2 and the assumptions of 7a, the error, implicit in the CPP net interest figure, associated with inflation is

$$B f_k [(1 + R_{tn})^{k-1} - (1 + R_{tk-1})^{k-1}]$$

Eq. 10

It derives from the difference in specification of the opening principal.¹² The size of the possible error

can be illustrated by reference to Appendix 1. Assume that the 8 year term rate of about 13% represents an average of expected annual rates during the first eight years and that expectations are correct, then B will have grown to $B(1 + .13)^8$, i.e. $B(2.66)$ by the end of year 8. The inflation linked error for year 9, using a 10 year term loan, can be calculated from equation 10 as follows:

$$\begin{aligned} B f_k [(1 + .1375)^8 - (1 + .13)^8] \\ = B f_k (2.80 - 2.66) \\ = B f_k (0.14) \end{aligned}$$

It is $f_k (0.05)$ of the capital outstanding at the commencement of the year, i.e. $2.66B$. Therefore, if inflation, f_k , is 10%, the error is 0.5% of the notional principal, if it is 20% the error is 1.0% and at an inflation of 100% the figures would imply an error of 5% of the calculated monetary balance at the commencement of the year.

It may be helpful to consider the size of the total error calculated using equation 9. Appendix 3 shows the CPP error calculated using the term structure at October 1975 and anticipating constant rates of inflation of 30% and 10% respectively. For ease of computation the equation was rearranged, when preparing the Appendix, as follows:

$$\begin{aligned} I_{tke} - D_e &= B[(1 + R_{tk})^k - (1 + R_{tk-1})^{k-1} \\ &+ (1 + R_{tn})^{k-1} \\ &- (1 + R_{tn})^k + f_k[(1 + R_{tn})^{k-1} \\ &- (1 + R_{tk-1})^{k-1}]] \end{aligned}$$

Eq. 11

For comparison purposes the expression in Eq. 11 can be divided by $B(1 + R_{tk-1})^{k-1} (1 + f_k)$ to determine the size of the error relative to a figure of real capital at the commencement of each period. Column 'e' of Appendix 3 shows the implied error arising from mis-specification of interest rates in the absence of inflation, column 'i' that due to the rate of inflation applied to differently specified principal at the commencement of the year and column 'j' the total error. All figures are proportions of the original sum borrowed. The reader will notice that the difference associated with inflation often reduces the overall error in absolute terms. Column 'l' shows the net calculated error as a proportion of the real principal, anticipated under the model, at the beginning of the year concerned. It shows figures which seem large enough to be of concern. Obviously these results have been derived using re-investment assumptions which are unlikely to be met in practice.

¹¹This has also been argued, under an assumption of constant money interest rates, by EM, op. cit., note 4 above. Their analysis was, however, somewhat different.

¹²Note that if the rate of interest is constant for all years the model implies no error, because the terms in the bracket equal zero.

Nevertheless they do give grounds for suggesting that the conventional CPP approach is only a crude approximation of the figures which would be shown if the accounts reflected the term structure existing at the contract date.

Further evidence is, perhaps, needed on this matter. One way to obtain it is to simulate a loan, without using the re-investment assumptions, applying the annual rates derived from our initial model of equations 3 and 3a. Approximate rates calculated on the latter bases, to be found in Appendix 2, have been applied to a loan of £100 and figures of annual principal and interest charges have been calculated. Appendix 4 compares the figures which would arise under the conventional CPP method with those derived from this type of term structure based approach. It will be observed that under this more realistic approach a quite sizeable error arises (e.g. in year 9 the difference is over 6% of the opening principal for both of the rates of inflation shown in the Appendix).

Differences in the rates of inflation now have a noticeable effect on the percentages, although the direction of the change is not identifiable merely by reference to the scale of inflation envisaged. If money transactions, and principal, calculated by reference to the differential costs underlying the term structure, are the correct basis for reporting, then conventional CPP practice would seem to materially misreport net interest charges irrespective of one's assumptions concerning future inflation.

The choice of method

Egginton and Morris (EM) identified two main ways of defining the real rate of interest for the year – assuming here that their ‘hindsight’ average rate is unacceptable because of the needs of periodic reporting before the termination of the loan agreement. The first was the present writer’s average real rate derived from management’s expectations for the remainder of the loan,¹³ i.e. r in

$$B = \sum_{t=1}^n \frac{C_t \frac{M_0}{M_t}}{(1+r)^t} \quad \text{Eq. 12}$$

where

C_t is the cash flow, associated with the loan, at the end of period t ,

M_0 is a general price index at the time of the loan,

M_t is the index at the end of period t ,

the loan is for ‘ n ’ periods,

B is as already defined.

During the currency of the loan, management would have to estimate M_t for future periods, but would know M_t for past periods. The second real rate identified by EM was that based on the contractual rate of interest (the term rate) and the actual rate of inflation for the year in question, i.e.

$$r_k = \frac{1 + R_n}{1 + f_k} - 1 \quad \text{Eq. 13}$$

where all terms are as previously defined and it is assumed (for present purposes) that there were no issue expenses, discounts or premiums involved. Equation 13 is the approach which they prefer if adopting the matching accounting model. This paper has now identified further real rates, which are those derived from recognising contractual cash flows adjusted by reference to the term structure at the date of the initial contract and inflation during the year in question. Which approach is preferable?

We can separate the options into money rate based methods – i.e. the term *structure* and the term *rate* approaches – which do not require forecasts of future rates of inflation, and the average real interest approach – which does rely on such forecasts. EM have said that the latter ‘would involve the selective inclusion of one element of management’s expectations regarding inflation and would provide unnecessary scope for creative accounting’. They would have been correct if they had omitted the word ‘unnecessary’! Of course, the stated disadvantages may outweigh the advantages. It is a matter of judgement whether that is so, but the discussion cannot be closed merely by reason of a strong assertion of personal opinion and we will now further explore the issue. We will consider the term structure based approach first and move to the average real rate via discussion of the use of the term rate.

The availability of different rates for different terms implies that, when contracting to borrow at a constant term rate, management may be incurring varying annual costs on the basis outlined for the term structure. One could, therefore, argue that the economic reality of the borrowing transaction

¹³Op. cit., note 4 above. The EM assertion that there was an implicit assumption that ex post and ex ante real interest are identical rather misses the point, because the analysis proceeded under what they would term ‘hindsight’ assumptions. It was suggested that, in practice, following the model, management would have to make ex ante estimates of future inflation during the currency of the loan to try to estimate the average real rate. Any estimate concerning the future, accepted as a basis for reporting discrete figures, necessarily assumes that future events will occur as estimated. It therefore becomes inevitable that one assumes that ex ante will be identical with ex post. Such estimates are very frequently made in accounting, so on that basis alone the ‘average real interest’ approach is not validly challenged.

requires that the reports of the principal outstanding and the interest charges should reflect that structure. The data required for the necessary calculations are usually available and objective, and the computations are neither complex nor time consuming. If the money flows inherent in the contract are the business reality, as EM suggest, then it is the term structure basis which seems likely to portray most realistically that reality – and not the contractual basis expressed by them. We should, however, stop to recall the purpose of our discussion, which we have defined as the consideration of bases for matching real costs with real revenue. Such a matching should surely recognise the constraints under which management operates.

A plausible hypothesis, which appeals to the writer, is that management tries to estimate inflows and outflows of resources, associated with alternatives, when evaluating proposals. Projects would then be considered to be financially acceptable if they were expected to generate positive net resource flows after recognising all associated costs (including those of financing). In the past bankers acting in the secondary (or 'wholesale') banking system have frequently adopted the practice of borrowing and lending for the same term so that their bank is covered against exposure to losses from interest rate changes, while making a profit because of the differential between borrowing and lending rates. The important feature of the process is that transactions will generally be matched¹⁴ over the same term, so that banks will presumably not seriously consider borrowing (to lend) for periods which are significantly different from those involved in current lending transactions when they are acting as financial intermediaries.¹⁵ In that case the constraints of the situation seem to be such that the only acceptable term is the one contracted. Therefore, irrespective of the way it was derived, the term rate seems to be the relevant figure of money cost throughout the period and the appropriate figure to set against interest receipts established on a similar basis so far as banking is concerned.¹⁶ It is interesting to speculate

that a similar, although less discernible, process underlies industrial borrowing and that firms attempt to arrange finance to fit in with their expectations of project flows, thus avoiding the uncertainties associated with subsequent refunding. Van Horne¹⁷ suggests an approach under which 'each asset would be offset with a financial instrument of the same approximate maturity', and such a recommendation is often found in descriptive treatments of business finance.¹⁸ If these prescriptions are soundly based on observed behaviour and institutional practice, then the non-banker businessman, to some extent, also engages in a matching process and not all of the opportunities afforded by the term structure may be considered relevant to his decision to borrow. We proceed on the assumption that the constraints on business borrowing do imply that the term contracted is, in fact, the only relevant one.

The significant difference between the position of the banker and, say, the industrialist is that in the case of the former the accounting matching process can be adequately based on the money flows relating to the period, whilst that does not apply to the latter (because one would anticipate that net revenue from physical investments would not form identical patterns, over time, to the expenses associated with borrowing to finance investment). However, if one assumes that the assets in which borrowed money is invested create net operating *cash* inflows and net money revenue evenly over their lives, that the term rate is also the money rate available on re-investment of project inflows and that such re-investments equal historical cost depreciation charges less net cash outflows for interest, then the adoption of the annuity method of depreciation will correctly assign total money costs, including net interest on the project as a whole, to money revenue. This is because the recorded interest figures will cancel each other – leaving the total money cost to be assigned by reference to the assumed pattern of money revenue.¹⁹ The model is based on the adoption of the money

¹⁴Note that the term is here used in a banking, and not an accounting, sense. It should be clear from the context which meaning should be attached to the word hereafter.

¹⁵See Jack Revell, *The British Financial System*, Macmillan, 1973 for discussion of this point. It could be argued that bankers are speculating when they do not match, so that a departure from that practice is merely a way of taking a position on interest rates (which is a separate transaction only linked to the financing activity in order to minimise transaction costs).

¹⁶Obviously the term rate contracted is *not* the appropriate one when the banker is speculating on interest rates, i.e. adopting an unmatched position. Ideally one would then use the term borrowing rate appropriate to the lending

periods agreed to establish financing costs, and show the differences between the interest paid and that which would have been payable using that term rate as a gain or a loss from speculation. Development of this topic is beyond the scope of this paper.

¹⁷James C. Van Horne, *Financial Management and Policy*, 3rd edition, 1974, Prentice-Hall, page 403.

¹⁸e.g. K. Midgeley and R. G. Burns, *Business Finance and the Capital Market*, Macmillan, 1969, page 54. Additional support for the concept is to be found by implication in J. S. Fleming, L. D. D. Price and S. A. Byers, 'The Cost of Capital, Finance and Investment', *Bank of England Quarterly Bulletin*, June 1976.

¹⁹Appendix 5 illustrates this point for anyone who wishes further explanation.

term rate, so that rate may be the most appropriate one to use for accounting in *money* terms if the specified assumptions are acceptable. Provided that the re-investment assumptions were retained it would, of course, be possible to devise depreciation policies which allocated total costs by reference to patterns other than that of annuities with similar results. The project flows may typically be re-investable at rates higher or lower than the term rate²⁰ but, under uncertainty, the latter may be acceptable for reporting *money* costs to be matched against *money* revenues.

Although the above analysis supports the use of the money term rate as a basis for matching money costs with defined money revenues, given the specified assumptions, problems arise under the model when the money transactions are converted to real terms using CPP conventions. The latter recognise the borrowing transactions as creating monetary liabilities and adjust accordingly to find what, under a constant *money* rate of interest model, may be considered to be (in aggregate) correct figures of net real interest cost, but do not show the physical assets in which cash is invested as yielding figures of loss on holding *monetary* assets. This problem may best be illustrated, again, by reference to the position of banks and others. If a bank borrows and lends the identical amount for the same term the holding gains and losses on monetary items calculated under conventional CPP will cancel out, i.e. it has matched its assets and liabilities and the net margin between the sums of interest is what matters. On the other hand, although, under the assumptions of the term rate model developed above, a firm borrows to purchase machinery expected to yield a defined stream of net cash inflows, the machine book value is increased under CPP. Given the stated assumptions the transaction is then wrongly recorded because the machine should be viewed as a monetary asset.²¹ This reasoning seems to destroy the validity of the above money term rate model as support for the conventional CPP approach. If the use of the term rate correctly matches interest costs against net revenues, because the company generates the term *money* rate

on its investments, and depreciation charges correctly reflect the patterns of *money* inflows from physical projects and total project costs, then such projects can be regarded as monetary assets and therefore as being incorrectly treated under CPP (although the calculated holding gains on liabilities may provide profit and loss account figures which, in total, correctly match real costs of financing to the real revenues earned). However, if investments are more likely to generate a constant *real* rate of return, then the money rate is probably inappropriate as a proxy for the re-investment return and the conventional CPP accounts probably incorrectly match financing costs against real revenue but their treatment of depreciation may be correct.

The discussion, so far, has proceeded as follows:

(a) Recognition of the term structure should most nearly approximate the economic reality underlying borrowing transactions, for management is likely to have had the opportunity to borrow for different terms if it had so wished.

(b) The desire to avert the uncertainties associated with refunding a loan, before it has been liquidated from the proceeds of investment of the funds originally raised, may lead to an attempt to arrange that the terms of loans should recognise the characteristics of projects currently being financed. Such a practice, which is recommended by a number of pragmatic books on business finance, may constrain management, so that repeated short term refunding for long term finance is not considered to be a feasible option and the term structure as a whole may be irrelevant to the firm's decisions. Interest cost to the firm may, then, best be defined by reference to the term rate.

(c) The 'accounting' matching process, using term rates, may work fairly well in banking, because both borrowing and investment transactions generate the same pattern of cash flows under a 'banking' matching financing strategy. This is not likely to be the case in industry, where flows from investments may demonstrate markedly different patterns. Adoption of the assumption that funds generated by projects can be re-invested

²⁰An opportunity to repay part of the sum borrowed, if it results in saving interest calculated at the term rate, can be regarded as an opportunity to invest at that rate.

²¹This is because the money term rate based method was supported by an analysis which assumed that assets generate a defined stream of cash flows, which would not be affected by unanticipated rates of inflation. The further assumption of constant money rates of return on re-investment would then mean that the conventional CPP treatment of monetary items could achieve the appropriate matching, i.e. the allocation of total costs (in real terms) by reference to the

proportion of the total revenue (in real terms) derived from the outlays and assigned to each accounting period. Note that this observation is made in respect of projects which are financed entirely by debt, and is illustrated by the example in Appendix 5. That example shows that the sum of the project book value and monetary assets (i.e. re-invested cash) always equals the principal on the loan, so that gains and losses on monetary items would cancel each other. As depreciation charges are assigned by reference to revenue flows, a correct matching of total real costs to real revenue is achieved, under this model, without adjusting historical cost depreciation figures to real terms.

to yield the term rate²² enables the historical cost accounts to be charged with a pattern of total project money cost which approximates that of the revenues from the project, e.g. by use of the annuity method of depreciation in the case of revenues which are expected to take the pattern of annuities.

(d) Under the assumptions of the outlined model, if borrowed funds are invested in monetary assets the CPP monetary item holding gains and losses cancel out, and the approach seems to correctly match costs and revenues in real terms. Problems arise on introducing physical assets, however, for if they yield money returns which are not significantly affected by inflation it could be claimed that the CPP treatment of such assets is wrong, because they can best be regarded as monetary investments (assets) for monetary returns. Conversely, if physical assets are expected to yield returns which prove more constant in real terms than in money terms, then the term rate money interest based figure of conventional CPP seems unlikely to adequately match project financing costs with revenue – although the CPP treatment of depreciation may then prove to be more correct.

Note that the reasoning advanced above in support of the conventional practice is not founded on the fact that the term rate represents the underlying economic reality at the time of borrowing (which by implication would seem to be the basis for the EM position on reports based on historical transactions). Adoption of the term rate on the basis of the analysis there presented requires assumptions concerning constraints on management action and expectations concerning re-investment possibilities. The same assumptions, expressed in real terms, can be used to justify the average real rate approach, using an analysis similar to that advanced for the term rate model. Appendix 6 illustrates the calculations under assumptions of a constant real rate of interest on re-investment of inflows equal to depreciation net of payments to the lenders. If an assumption of constant real returns from re-investment is sounder than that of constant money returns, then the average real return approach would appear to be superior to its money rate based conventional CPP counterpart, for it could achieve a more appropriate accounting matching of costs and revenues.

The writer is not aware of any empirical evidence indicating the superiority of either a constant money

return or constant real return assumption under inflation, so choice must be based on judgement. Perhaps the obvious course of action is to adopt the option which involves least practical problems by way of estimation and inclusion of subjective data in the accounts, i.e. conventional CPP. Casual observation suggests, however, that the output of that model has been viewed with considerable scepticism by many businessmen. This may, of course, be merely the result of a failure to understand the significance of CPP type information as a whole. Nevertheless, it could suggest that the business community does not recognise the pattern of net of inflation adjustment interest costs emerging as representing its perception of reality, so it may be prudent to pause before making the most convenient choice. Many readers may echo that sentiment and suggest that current value accounting be used instead of a CPP type approach.

Current interest rates

EM stated two purposes for their comment. The first was to challenge the average real rate approach, which they did with a model which could be presented as a special case of the more general term structure model developed earlier in this paper. A second purpose was to suggest that *current* market interest rates would be a better basis for reporting financing costs, e.g. 'it would be appropriate to charge the current market interest cost against revenues . . .' The use of current rates in that way could lead to the presentation of information which is potentially misleading.

It seems reasonable to suppose that, when borrowing, management compared the cost of obtaining funds with the returns to be obtained from investing the monies raised. If revenues were expected to be sufficiently in excess of costs, the combined borrowing and investment transaction would have appeared to be worthwhile and was probably adopted. Similarly, if such expectations proved to be correct, one would hope to see the resulting increment in wealth reflected in the accounts. It appears, then, that for some purposes the relevant figures are those based on the historical transactions. To follow the advice of EM risks charging current interest rates, at which the firm may not have borrowed, against revenues obtained from investment of funds obtained at different rates. An extreme case of this, which illustrates the potential absurdity of the situation, is again the banker. Suppose he borrowed long term at 8% and lent at 12%, and that now the rate at which he can borrow is 14% – should we charge the latter rate and show a loss of 2% of the amount involved

²²The reader will recall that other assumptions are also necessary. It seems likely that the assumption concerning the re-investment rate is the most unrealistic, however.

in the original transaction? Such a practice seems quite wrong: obviously the related figures are those of 8% and 12%. Similar arguments can be advanced in respect of borrowing by non-bank companies. We are back with historical transactions again – which is probably where we ought to be!

Conclusions

This paper has developed an analysis relating the term structure of interest rates to financial accounts and considered its implications for the disclosure of holding gains from long-term liabilities in an inflationary period. The size of the conventional CPP errors derived by the models was found to be a function of the error in the underlying monetary variables, and seemed to be material. Further it was found that the EM model was a special case of the general one developed by the paper.

Consideration of the choice of the approach to be adopted in practice indicated that, so far as CPP is concerned, the matter is far more complex than EM

implied. There are grounds for choosing each of the average real cost, the term structure based and the term rate (conventional) approaches – furthermore there are arguments concerning practicability or unrealistic assumptions to be levelled at each. In the absence of empirical evidence it appears that choice must be very much a matter of personal opinion and judgement.

The use of current rates of interest in reporting costs, as suggested by EM, was discussed and dismissed as inappropriate for the purposes assumed for accounts.

It seems, to the writer, that the subject of defining the net interest cost for inclusion in CPP accounts is one which is fraught with conceptual difficulties. This paper merely identifies some of them and defers judgement. It is to be hoped that further debate and the presentation of empirical evidence will move us nearer to an acceptable practical solution, which might include the presentation of information on a number of bases.

APPENDIX 1**Approximate Term Structure of British Government Securities October 1975**

<i>Term in Years</i>	<i>Approx. Term Rate R_{tn}</i>	$(1 + R_{tn})^n$	$\frac{\text{Annual Rate } (1 + R_{tn})^n}{(1 + R_{tn-1})^{n-1}} - 1 = r_{ti}$	<i>Difference from 10 year Term Rate 13.7%</i>
1	11.2%	1.1120	11.2%	+ 2.5%
2	12.0%	1.2544	12.8%	+ 0.9%
3	12.2%	1.4144	12.8%	+ 0.9%
4	12.5%	1.6018	13.2%	+ 0.5%
5	12.2%	1.7821	11.3%	+ 2.4%
6	12.1%	1.9844	11.4%	+ 2.3%
7	12.5%	2.2807	14.9%	- 1.2%
8	13.0%	2.6584	16.6%	- 2.9%
9	13.5%	3.1258	17.6%	- 3.9%
10	13.7%	3.6267	16.0%	- 2.3%

Note: This appendix is based on estimates from Fig. 1 and equation 2.

APPENDIX 2**Approximate Term Structure at 31st October 1975**

<i>Year</i>	<i>Approx. Term Rate R_n</i>	<i>Annual Rate (r_{ti}) by Eq. 2</i>	<i>Annual Rate (r_{ti}) by Eq. 3</i>	<i>Annual Rate (r_{ti}) by Eq. 3a</i>
1	11.2%	11.2%	11.2%	11.2%
2	12.0%	12.8%	12.9%	12.9%
3	12.2%	12.8%	12.9%	12.9%
4	12.5%	13.2%	13.4%	13.4%
5	12.2%	11.3%	10.9%	10.9%
6	12.1%	11.4%	11.1%	11.1%
7	12.5%	14.9%	16.2%	16.2%
8	13.0%	16.6%	19.2%	19.2%
9	13.5%	17.6%	21.7%	21.7%
10	13.7%	16.0%	18.9%	18.9%

APPENDIX 5

Disclosure of Net Interest Charge under the Annuity Depreciation Method with identical borrowing and re-investment rates

Assume the purchase of a machine for £9,000 financed by borrowing the whole amount at a rate of 10%, which is also the rate available on re-investment. The life of the machine and the term of the loan are both three years. This set of transactions could be shown, under the annuity method, as follows:

Year	Balance b/f	Interest Charge to Asset	Depreciation Charge	Interest Receipt from Asset	Interest Receipt* from Retained Project Flows less Interest Payments	Interest Payment	Net Interest per Accounts
	£	£	£	£	£	£	£
1	9000	900	3619	900	—	900	—
2	6281	628	3619	628	272	900	—
3	3290	329	3619	329	571	900	—
*Year 1 — Depreciation			3619				
Less: Year 1							
Interest paid			900				
Cash re-invested			2719				
Year 2 — Interest received		272					
Depreciation		3619					
		3891					
Less: Year 2							
Interest paid		900	2991				
Cash re-invested to date			5710				
Year 3 — Interest received			571				

APPENDIX 3

Error in CPP net interest/real capital at commencement of periods
(Using Eq. 2)

Years	$+(1 + R_{tk})^k$	$-(1 + R_{tk-1})^{k-1}$	$+(1 + R_m)^{k-1}$	$-(1 + R_m)^k$	Sum of Cols. 'a' to 'd'	$+(1 + R_m)^{k-1}$	$-(1 + R_{tk-1})^{k-1}$	Sums of Cols. 'f' and 'g'
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1	1.1120	-1.0000	1.0000	-1.1375	-0.0255	1.0000	-1.0000	0.0000
2	1.2544	-1.1120	1.1375	-1.2939	-0.0140	1.1375	-1.1120	0.0255
3	1.4144	-1.2544	1.2939	-1.4718	-0.0179	1.2939	-1.2544	0.0395
4	1.6018	-1.4144	1.4718	-1.6742	-0.0150	1.4718	-1.4144	0.0574
5	1.7821	-1.6018	1.6742	-1.9044	-0.0499	1.6742	-1.6018	0.0724
6	1.9844	-1.7821	1.9044	-2.1662	-0.0595	1.9044	-1.7821	0.1223
7	2.2807	-1.9844	2.1662	-2.4641	-0.0016	2.1662	-1.9844	0.1818
8	2.6584	-2.2807	2.4641	-2.8029	0.0389	2.4641	-2.2807	0.1834
9	3.1258	-2.6584	2.8029	-3.1883	0.0820	2.8029	-2.6584	0.1445
10	3.6267	-3.1258	3.1883	-3.6267	0.0625	3.1883	-3.1258	0.0625

Data taken from Appendix 1, using a 10 year term loan with the term structure at December 1975, Equation 11 from the paper and rates of inflation of 30% and 10%

APPENDIX 3 continued

Col. 'h' x $f_k = .3$	Col. 'e' + Col. 'i'		$(1 + R_{k-1})^{k-1}(1 + f_k)$ for $f_k = .3$		Col. 'j' / Col. 'k'		Col. 'l' as %	
	$f_k = .3$	$f_k = .1$	$f_k = .3$	$f_k = .1$	ie real error/real principal at k-1 $f_k = .3$	$f_k = .1$	$f_k = .3$	$f_k = .1$
	(i)	(j)	(k)	(l)	(m)			
0-0000	0-0000	-0-0255	1-3000	1-1000	0-0196	0-0232	2-0%	2-0%
0-0077	0-0025	-0-0063	1-4456	1-2232	0-0044	0-0094	0-4%	0-9%
0-0119	0-0039	-0-0060	1-6307	1-3798	0-0037	0-0101	0-4%	1-0%
0-0172	0-0057	+0-0022	1-8387	1-5558	0-0012	0-0060	0-1%	0-6%
0-0217	0-0072	-0-0282	2-0823	1-7620	0-0135	0-0242	1-3%	2-4%
0-0367	0-0122	-0-0228	2-3167	1-9603	0-0098	0-0241	1-0%	2-4%
0-0545	0-0182	+0-0529	2-5797	2-1828	0-0205	0-0076	2-0%	0-8%
0-0550	0-0183	+0-0939	2-9649	2-5088	0-0317	0-0228	3-2%	2-3%
0-0434	0-0144	+0-1254	3-4559	2-9242	0-0363	0-0330	3-6%	3-3%
0-0188	0-0062	+0-0813	4-0635	3-4384	0-0200	0-0200	2-0%	2-0%

APPENDIX 4

Simulation of £100 borrowed for 10 years at 31st October 1975 – assuming 10% & 20% Inflation

Term Rates Appendix 2	Year	Money Principal at Commencement of Year	CPP Interest Cost				Net Charge	
			Money Interest Charge	10% Inf.	Holding Gain	30% Inf.		
%		£	£	£	£	£	£	£
11.2	1	100	13.75	10	30	3.75	–16.25	
12.9	2	100	13.75	10	30	3.75	–16.25	
12.9	3	100	13.75	10	30	3.75	–16.25	
13.4	4	100	13.75	10	30	3.75	–16.25	
10.9	5	100	13.75	10	30	3.75	–16.25	
11.1	6	100	13.75	10	30	3.75	–16.25	
16.2	7	100	13.75	10	30	3.75	–16.25	
19.2	8	100	13.75	10	30	3.75	–16.25	
21.7	9	100	13.75	10	30	3.75	–16.25	
18.9	10	100	13.75	10	30	3.75	–16.25	

APPENDIX 4 continued

Money Principal at Commencement of Year	Term Structure based CPP Interest Cost				Net Charge		Difference as % of Principal at Beginning of Year			
	Money Interest Charge	Holding Gain	10% Inf.	30% Inf.	10% Inf.	30% Inf.	Money Costs & Money Principal (under term structure)	10% Inf.	30% Inf.	Real Costs & Real Principal at Commencement of Year
£	£	£	£	£	£	£	%	%	%	%
100.00	11.20	10.00	10.00	30.00	1.20	-18.80	2.5	2.3	2.0	2.0
97.45	12.57	9.75	9.75	29.24	2.82	-16.67	1.2	0.9	0.3	0.3
96.27	12.42	9.63	9.63	28.88	2.79	-16.46	1.4	0.9	0.2	0.2
94.94	12.72	9.49	9.49	28.48	3.23	-15.76	1.1	0.5	0.4	0.4
93.91	10.24	9.39	9.39	28.17	0.85	-17.93	3.7	2.8	1.4	1.4
90.40	10.03	9.04	9.04	27.12	0.99	-17.09	4.1	2.8	0.7	0.7
86.68	14.04	8.67	8.67	26.00	5.37	-11.96	0.3	1.7	3.8	3.8
86.97	16.70	8.70	8.70	26.09	8.00	- 9.39	0.3	4.5	6.1	6.1
89.92	19.51	8.99	8.99	26.98	10.52	- 7.47	6.4	6.8	7.5	7.5
95.68	18.07	9.57	9.57	28.70	8.50	-10.63	4.5	4.5	4.5	4.5

APPENDIX 6

Disclosure of Net Interest Charge under the Annuity Depreciation Method with identical real borrowing and re-investment rates and general index adjustments

Assume the purchase of a machine for £9,000 financed by a loan with a money rate of 10%, the money principal being repaid at the end of the 3 years. It is anticipated that the annual net inflows from the project will be constant in real terms over a life of 3 years, so that an adjusted annuity depreciation approach is considered appropriate. Inflation is 8% per annum throughout the period. Project inflows can be re-invested to yield the real cost of borrowing to finance the project.

We can proceed as follows:

(a) Calculate real rate of interest

$$9000 = \frac{900}{(1+r)(1+0.08)} + \frac{900}{(1+r)^2(1.08)^2} + \frac{9900}{(1+r)^3(1+1.08)^3}$$

$$\therefore 9000 = \frac{833}{(1+r)} + \frac{772}{(1+r)^2} + \frac{7859}{(1+r)^3}$$

$$\therefore r = 1.85\%$$

(b) Interest charges and repayment of principal are, in real terms,

	Year 0 prices		Year 1 prices		Year 2 prices		Year 3 prices	
Year 1	Principal	Interest	Repay	Interest	Repay	Interest	Repay	Interest
Opening Balance	9000							
Interest (1.85%)		166		179		194		209
Repayment $\left(\frac{900}{1.08} - 166\right)$	667		720		778		840	
	8333							
Year 2								
Interest (1.85%)		154		166		180		194
Repayment $\left(\frac{900}{(1.08)^2} - 154\right)$	617		666		720		777	
	7716							
Year 3								
Interest (1.85%)		143		154		167		180
Repayment $\left(\frac{9900}{(1.08)^3} - 143\right)$	7716		8333		9000		9720	
	—							
Total Repayments	9000		9719		10498		11337	

APPENDIX 6 *continued*

(c) Annuity Depreciation – Year 0 prices

<i>Year</i>	<i>Balance b/f</i>	<i>Interest Charge to Asset at 1.85%</i>	<i>Depreciation Charge</i>	<i>Interest Receipt from Assets</i>	<i>Interest Receipt from Retained Project Flows*</i>	<i>Interest Payment (see 'b' above)</i>	<i>Net Interest per Accounts</i>
1	9000	166	3112	166	—	166	—
2	6054	112	3112	112	42	154	—
3	3054	57	3111	57	86	143	—
					£		
*Year 1 Depreciation					3112		
Less: Interest paid					166		
					<u>2946</u>		
Less: Repayment of loan year 1 (see 'b' above)					667		
					<u>2279</u>		
Re-investment in year '0' prices					2279		
Year 2 Interest Received (year '0' prices) 1.85% of 2279					42		
Depreciation					3112		
					<u>5433</u>		
Less: Interest paid					154		
Repayment of loan year 2 (see 'b' above)					617		
					<u>4662</u>		
Year 3 Interest Received (Year 0 prices) 1.85% of 4662					86		

(d) The figures of 'c' above can be converted into the prices of any year for accounting purposes. Thus for year 3 they would be:

Interest receipt from asset	£
<u>57 (1.08)³</u>	72 approx
i.e. 1.85% of £3054 (1.08) ³	
Interest receipt from re-investment	
<u>86 (1.08)³</u>	108 approx
i.e. 1.85% of £4662 (1.08) ³	
Interest payment	
<u>143 (1.08)³</u>	180
Net interest cost	<u>—</u>

The depreciation figures would be adjusted in a similar fashion.

APPENDIX 6 *continued*

(e) The payment to the lenders in year 3 prices would be:

Interest 143 (1.08) ³	£ 180
Repayment of principal 7716 (1.08) ³	9720
Final cash payment at the end of year 3	<u>9900</u>

(f) Depreciation patterns could be changed to recognise the generation of revenues in forms other than that of annuities.

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Book Reviews

Evolution of Cost Accounting. S. Paul Garner. University of Alabama Press. First published 1954. Re-issued in the 'Accounting History Classics' series, Academy of Accounting Historians, 1976. \$6.50. xiv + 416 pp.

'Authoritative works in the history of accounting are a rarity and this book is most welcome.' Thus began a review by Professor Anton in 1955 (*Accounting Review*, Volume XXX, page 370) of Dr. Paul Garner's *Evolution of Cost Accounting*. It is with a mixture of regret and pleasure that I echo those words twenty-two years later; regret, because it remains true that authoritative works in the history of accounting are a rarity; pleasure, because Dr. Garner's book will be more readily accessible to a welcoming readership. Something else remains the same in 1977 as in 1954, the American dollar price of \$6.50. This has been achieved by the efforts of the Academy of Accounting Historians, the University of Alabama Press, the Arthur Andersen & Co. Foundation and Dr. Garner himself, in waiving his royalty rights. All are to be congratulated on an excellent start to what, I hope, will be a most useful series of re-issued 'accounting history classics'.

The book comprises twelve chapters of varying lengths. The first and second chapters take the reader from mediaeval times to 1885. The next three chapters examine the three main elements of 'accounting' cost – raw materials, direct labour and 'manufacturing burden' (overheads). The chapter on overheads is much the longest in the book and is divided into six parts: (1) items to be included; (2) imputed interest and rent; (3) burden control accounts; (4) the allocation of burden to product; (5) pre-determined burden and the problem of idle time; (6) departmentalisation and distribution of burden. Chapters 6 to 11 are quite short (one has only nine pages) and cover the evolutionary aspects of, respectively, the integration of cost and financial records, inter-departmental transfers of product, accounting for by-products, accounting for waste material and scrap, the methods and theories employed for valuing factory inventories, and process and job order cost methods. The final chapter, 'In the Light of the Past', reviews the purposes and contents of the book.

The extent of the detailed preparatory work carried out by Dr. Garner is demonstrated by a selected bibliography of over 350 items, and a remarkable 950 footnotes. Given these large numbers,

it is perhaps not surprising that one or two minor errors have crept in. Robert Hamilton's *Introduction to Merchandise* is stated to have been first published in 1788, with a second edition in 1820. In fact, the book was first published in 1777 and ran through a further four editions (1788, 1797, 1799 and 1802) before the last edition, revised by Elias Johnston, in 1820. The footnotes themselves contain one or two gems, such as a potted history of the term 'oncost', which seems first to have been used in the fifteenth century in the *Aberdeen Register*, and as somewhat ungentelemanly wrangle between C. H. Scovell and H. L. Gantt over who should take the credit for first treating idle time as a loss rather than a cost. Such gems are not confined to the footnotes: Dr. Garner suspects Darwinian influence on overhead allocation, in an article by David Cowan in 1901 (pages 189–190); and on page 264, he quotes from an editorial in *The Accountant* which regarded the integration of cost and financial records as impracticable in most cases, though not impossible, and argued that the two sets of accounts should not be co-ordinated because 'costing clerks belong to a somewhat different category to ordinary book-keepers; and it is desirable that the two . . . should be kept separate, for this reason if for no other.' Unfortunately, the editor did not expand upon this theme.

Dr. Garner is careful to be explicit about the boundaries of the book: it deals with the evolution of the ascertainment of historical 'accounting' costs. He does not discuss cost estimation, standard costs or cost control, let alone opportunity cost and related concepts. The choice of 1925 as the study's terminal date enables Dr. Garner, with justification, to exclude some of these topics, although he makes some references to J. M. Clark's *Studies in the Economics of Overhead Cost*, published in 1923, a book which is now regarded as being of great importance to cost accounting. At the time, however, it had little impact on cost accounting, and this is reflected in Dr. Garner's treatment of Clark's work. He quotes passages from Clark, but omits what might be seen as the most potentially significant to his book – 'if cost accounting sets out, determined to discover what the cost of everything is, and convinced in advance that there is one figure which can be found and which will furnish exactly the information which is desired for every possible purpose, it will necessarily fail, because there is no such figure. If it finds a figure which is right for some purposes, it must

necessarily be wrong for others' (Clark, page 14). It is precisely such attempts to find *the* cost which Dr. Garner has so ably chronicled, and yet he has not incorporated any significant discussion of the aims and purposes of the cost accounting practices described. The reader is often left to infer the purpose from the context. In the first three pages of chapter one, the impression is given that industrial accounting differs from cost accounting, but the reader is not offered any definitions, or explanations of the difference.

Dr. Garner's source material changes its nature as the book develops. The first chapter, on the mediaeval period, relies on extant records of various concerns situated in present-day Italy, Germany, Austria and Belgium. Thereafter, the sources are mainly British and American, on the reasonable ground that these countries dominated cost accounting at the time, although the work of the French writers Payen and de Cazaux is briefly discussed. Incidentally, Dr. Garner's proper, if perhaps excessive, concern to accord the correct nationality to the writers did not prevent him from describing the sprinkling of Scots as 'English'. The sources are almost exclusively books and articles, not accounting records, and thus the development of practice can only be inferred in an indirect and hazy manner. As another reviewer of Dr. Garner's book, P. N. Wallis, put it, 'The fact that accountants knew how to do a particular thing thirty years ago, does not necessarily prove that it is in fact done in manufacturers' offices even today.' (*Accounting Research*, Volume VI, 1955, page 70). It should also be noted that Dr. Garner has concentrated almost exclusively on industry and commerce. Agriculture has scarcely received a mention—two pages are devoted to de Cazaux's work—and yet many industrial cost problems also occur in agriculture, not least the problems of overheads and inter-departmental transfer pricing. The practices of Robert Loder in his account book 1610–1620 are relevant. In addition to his use of opportunity cost techniques, for which he is perhaps best known, Loder maintained cost records of the type which are the subject of Dr. Garner's book. The work of C. S. Orwin, particularly his *Determination of Farming Costs*, 1917, coincides with the beliefs and attitudes to cost accounting of many of the writers on industrial accounting cited by Dr. Garner. Orwin's reaction to those who suggested, for example, the inter-departmental transfer of a product at other than *the actual cost of production* is an excellent example of contemporary cost accounting attitudes.

What are Dr. Garner's conclusions? These are summarised in the final chapter, although in his preface (page xii) he states that the remarks in the

final chapter 'should not be considered conclusions, the reason being that cost evolution by its very nature is dynamic rather than static, and no statements made in regard thereto can be final or definitive'. His concluding remarks, though, are illuminating. He detects some interest, among accounting writers before 1885, in cost theories and practices, although 'few authorities prior to that time had considered the subject worthy of their undivided attention' (page 341). He also expresses the opinion, with qualifications, 'that the so-called "depression years" in industrial activity have been especially fruitful periods for introducing and developing new cost techniques and procedures' (page 342). Perhaps most important is his observation that 'cost theories and techniques have evolved as a product of their industrial environment, and their rapid development has been necessitated by the continually increasing complexity of manufacturing processes' (page 342).

Dr. Garner's book is, however, not so much of value for these remarks, interesting though they are, as for the wealth of detailed and critical examination and investigation that lies behind them, and to which, through its pages, the reader has access. Although some parts of the book are ponderous, Dr. Garner manages to offer a stimulating approach to what can be a sombre and forbidding subject. The book is, and, rightly, will long remain, the standard work on cost ascertainment ideas and techniques. Perhaps its re-issue will stimulate more research into the history of other aspects of cost accounting.

University of Kent at Canterbury

John Freear

Analysed Reporting. A Research Study prepared for the Research Committee of the Institute of Chartered Accountants in England and Wales. Coopers and Lybrand, 1977. 208pp. £6.95.

The evolution of large companies with diverse business and geographical activities has stimulated an increasing interest in analysed or segment reporting. A growing though modest body of disclosure requirements at the national level (e.g. in Canada, France, South Africa, Sweden, UK, USA) is now supported by developments at the international level of the EEC and OECD. But a major difficulty exists with many of these requirements including those prevailing in the UK. This is the failure to specify adequately criteria by which to identify the segments to be disclosed. Thus managerial discretion reigns with the potential for poor quality disclosure or no disclosure at all.

In the UK the accounting profession is aware of this problem and is currently in the process of developing a set of requirements which will, it is

hoped, remove some of the weaknesses of the 1967 Companies Act. This study of *Analysed Reporting* by Coopers and Lybrand (written by Adrian Lamb) is an input to this process in that the aim is to provide background material relevant to an appreciation of the extent to which companies with diverse activities do not provide segmental analyses and yet might usefully be required to do so.

The study covers current requirements, practices, and developments in a number of countries; together with a review of the debate, and a presentation of views by Lamb on what should be done in the UK. In addition, substantial appendixes, taking up nearly two-thirds of the book, include extracts from legal and professional documents, from surveys of published accounts, and from individual company reports. This certainly represents a useful compilation and survey of relevant material from existing sources. But there are some deficiencies. There are also grounds for some disagreement with the views expressed though this is not surprising owing to the controversial nature of many aspects of segment reporting. Consider then just some of these points of interest.

The main deficiency of the study is that little attempt has been made to assess the quality of disclosure practices by UK companies. Nor has the capacity for disclosure by those companies not providing analyses been evaluated. Coopers and Lybrand would appear to have missed a valuable opportunity here, for their knowledge and practical experience of company activities must be enormous. But regrettably none of this has been brought to bear on the issues. In fact, the only original empirical contribution seems to be confined to a one page survey of the number of companies providing geographical analyses of turnover and/or profit and to those analyses (either business or geographical) covered by the audit report. Interestingly, only 8% of the analyses provided are audited, which does perhaps tell us something about the current state of professional concern in practice.

As regards the views expressed in the study, it would seem that Lamb is in essential agreement with the approach adopted by the Financial Accounting Standards Board in FAS14 recently issued in the USA. The difficulty with this is that the imposition of such a detailed set of quantitative criteria (incorporating 10 separate tests) to determine the number of segments to be reported does not avoid the pitfalls in the prior process of segment identification, i.e. whether or not a separate segment or line of business exists. The use of a standard classification as a possible basis for such an identification is rejected by Lamb in favour of leaving it to management to use their discretion in determining whether

meaningful analyses can be provided. But this would represent no improvement whatsoever on existing legal requirements which are largely ineffective. It is suggested, however, that management should be required to explain the basis upon which analyses are or are not provided. Moreover, guidelines to help management in their deliberations are recommended but these are so vague as to render the auditor's task a hopeless one. It is easy to talk in general terms about identifying differences in growth, profitability and risk but difficult to relate these generalities to the practical task of identifying segments and verifying their existence without more precise criteria. It would be interesting to know something of Coopers and Lybrand's experience in this area and what the practical difficulties of audit are likely to be. On the question of audit, Lamb's suggestion that analysed reports covering assets employed as well as turnover and profits should form an integral part of the accounts and audit is fundamentally important given the dominant position in the UK economy of large companies with diverse business and geographical activities. A final point concerns the problem of providing meaningful analyses when a company is highly co-ordinated or integrated for economic reasons. This difficulty is recognised and it would seem desirable to incorporate some criteria which will enable such companies to be recognised and disclosures waived. However, Lamb's suggestion that a level of inter-segment sales of 20% could be used as an indicator does seem an arbitrarily low cut-off point by which to identify an integrated business.

In summary, the Coopers and Lybrand study provides a useful survey of extant arguments, requirements, practices and developments. But the need for a more in-depth examination of issues relating to the quality of disclosures in the UK context remains. The American solution is not necessarily applicable in the UK and it is in any case fundamentally weak in respect to segment identification. If a meaningful UK standard on analysed or segment reporting is to be formulated then much more groundwork is desirable.

University of Lancaster

S. J. Gray

The Audit of Public Companies. Hilton & Robin Atkins. LEFTA, 1977. 32 pp.

The message of this tract is stark. The accounting profession is in a mess. Here, the authors say, are the reasons:

- (a) inability of the accounting institutes to control their affairs in a competent manner;

- (b) failure of the accounting standards programme, and, furthermore, the inability to enforce standards;
- (c) conflict of interest in the accounting profession between the auditor and the accountant in industry;
- (d) lack of modern training methods, research and development;
- (e) lack of independence and competence in the profession and professional firms.

It is a disaster. The wellbeing and independence of the profession are 'a vital adjunct to the nation's industrial, commercial and financial stability'. What is the remedy?

The 'wellbeing and independence' of this ailing profession can only be restored by state control. There must be public accountability and in order to achieve this a Public Body must be set up, under the control of the Department of Trade:

Its executive members' appointments would be approved by the Secretary of State for industry, and the 'PB' would carry out its work within the laid-down ministerial guidelines. The executives [*sic*] members of the 'PB' would comprise, inter alia, persons from the accountancy profession, other professions, industrialists, trade unionists and civil servants from the 'D o T'. There should be a real balance of expertise, so that only about one third of the executive members and staff would come from the accountancy profession

The authors of *The Audit of Public Companies* are two chartered accountants, father and son, Hilton and Robin Atkins. Both can claim experience of accounting in public practice and industry. Their pamphlet is unashamedly political, as its provenance indicates: its publisher is LEFTA – the Labour Economic Finance and Taxation Association. Given its political affiliations, by the way, LEFTA is an oddly elitist organisation, for membership is restricted to members of the Labour Party who are professionally engaged in the spheres of economics, finance and taxation.

Learned journals do not normally notice political tracts and it may be asked why the work under review should be singled out for special treatment. It is not because it is intellectually distinguished, original or well researched, but rather because it is a good example of a current phenomenon – the attempt to politicise and de-professionalise the professions.

The work suffers from a defect typical of its genre. It is lean on facts and evidential data. Where facts are cited, they too often prove erroneous. Here is an example. The authors assert that accounting standards began as a result of outside pressure following the GEC/AEI takeover in which two accounting treatments had produced on the one hand a loss of £4½ million and on the other a profit of £10 million

for AEI's annual results. Of this reportage, only the numbers are correctly stated. The AEI/GEC merger commotion was not the sole or main cause of accounting standards: the origins were far more deep-rooted and diverse, and the discrepancy between AEI's forecast profit of £10 million and the final reported loss of £4½ million was not due to different accounting treatments, but principally due to different judgemental estimates by different managements. The facts were clearly explained by the auditors at the time, but almost all subsequent commentators have ignored their expert witness and preferred the myth here perpetuated by Messrs. Atkins. The facts are well documented and easily accessible, but the authors have ignored them. Even when auditors speak out clearly it is, it seems, their fate to go unnoticed. Perhaps self-immolation is the only way to get attention.

This is only one example of factual error. There are others. For example, it is asserted that 'in many cases [accounting] standards have not been accepted as realistic or well thought out by industry, and therefore have not always been adopted'. From this assertion is developed the conclusion, already noted, that the accounting standards programme is a failure. It would be interesting to know on what evidence Messrs. Atkins base these assertions. The English Institute has published over a number of years an annual survey of the published accounts of 300 major British listed companies. The effect of the accounting standards programme is easily demonstrated by comparing the survey of 1969 reporting practices (before the launch of the accounting standards programme) with later years. The improvements are prodigious. And the same surveys indicate that standards are rapidly and effectively embraced by reporting companies. The truth is that Messrs. Atkins make no attempt to prove their charge that 'in many cases' standards have not been accepted or adopted, and the available evidence is plainly against them.

Their errors extend into other areas. It is not true, for instance, that 'the Institutes' councils' act as 'judge, jury, prosecutor and law maker' in the matter of ethical enforcements. Nor is it true that there is a statutory provision in the USA limiting an auditor's fees from any one client to not more than 5% of his gross fees.

In general, the authors allege that the British accounting bodies act too slowly and too late. The effect of the apprenticeship system of training 'has been to encourage mediocrity and engender a spirit of traditionalism and an inability to adapt'. Low salaries paid during training have made it difficult for young people from a working class background

to enter the profession, though later it is stated that the fact that salaries offered to graduates must be reasonably competitive has meant that more young people from a working-class background now have an opportunity to enter the profession, provided they take the 'graduate entry' route (which is now the majority route). Why is it that the middle classes imagine everybody wants to be like them? Many working class people would rather die. The authors are typical of their class in their evident ignorance of working class attitudes and attributes. They do not seem to realise that you cannot be a member of the professional class and the working class at the same time. You can emigrate to the professional class from the working class, but not vice versa. Sociologically, it now appears that the working class has become a hereditary caste. You must be born into it. It was not always so. There was greater social mobility in this country at the beginning of this century than there is now. It is true that social mobility is decreasing, when it should be increasing, but that is not the fault of the accounting profession, which remains as open as any profession may be (and more open than some 'working class' trades) to persons of ability and application.

As noted, Messrs. Atkins' remedy for the ills of the profession is state control. The governing 'Public Body' would be responsible for making and enforcing ethical rules and accounting and auditing standards. (It is instructive to note that no division of legislative, judiciary and executive functions is envisaged, though the authors castigate the accounting bodies for exactly this alleged failure to separate them.) The 'PB' would also license auditing firms to carry out audits of public companies. A striking feature is the authors' view that there are only about a dozen firms likely to meet the licensing requirements. Licensed firms would be restricted to specific industries, 'but not so as to create audit monopolies'. It would have been more persuasive if the authors had explained how such a non-monopolistic distribution between a dozen firms is to be achieved bearing in mind that the major industrial, commercial and financial sections of a modern economy can be divided into about thirteen main segments. Licences would be reviewed annually, in an ongoing process of selection and re-selection. It is reassuring to know that no hardship should accrue to firms that are not licensed (or, presumably, are deprived of their licences) because the markets for other services and auditing of non-public companies will be adequate compensation. Public company audits would be rotated every five years amongst licensed firms. The authors regard with equanimity the economic and organisational consequences for firms and their personnel of

this erratic and uncertain régime. So much for learning curves.

By no means all their ideas are misconceived, though some are implausible. They sensibly favour audit committees (though they wish to import the unloved Bullock concept of worker directors); one sympathises with the proposal that it should be a criminal offence for any director or other official of a company to exert unfair pressure on auditors, but it is difficult to envisage how such a provision could be enforced.

The most serious defect of the authors' work is its total lack of hard statistical evidence. We are given no information about the size of the profession, its growth, or its economics (though at one point we are told that partners in American accounting firms are remunerated out of all relation to normal United Kingdom earnings, a discovery which will hardly come as a surprise to those whose travels have forced in on them the lesson that Britain is a low-wage economy by comparison with its peers in North America and the European Community). The authors seem unaware that 90% of qualified British accountants operate wholly in the private sector. The suggestion that they should be put under direct ministerial control, with its concomitants of political intervention and direction, bureaucracy and the suppression of information through the expedient of the Official Secrets Act, is a notion that British industry, and the private sector as a whole, would do well to examine with considerable alarm.

How would a defence counsel answer the accusations of the authors? He could rebut them by asking the following question: can you think of a British industry which has emerged within the last century; operates within the single most strongly developing sector of the economy – the information sector; attracts some of the most skilful members of the population; shows net employment growth at a rate of almost 5% p.a. compound; receives no state aid or subsidies: offers a rewarding and useful career to its incumbents: and is highly respected for its activities around the world? Those characteristics describe the British accounting profession. People who want to revolutionise it should be able to prove that their prescription will enhance, and not impair, a profession which has demonstrated its success.

The overall impression gained from the pamphlet is that it is written by two well-meaning but impractical accountants turned politicians who exhibit the educational and training deficiencies of which they themselves accuse the accounting profession. *Ipse dixit!* The danger is that an uninformed public may without question swallow their prescription. It would be a fatal dose for the British accounting



profession, with profound consequences for the private sector and British industry.

London

Michael Renshall

Management Accounting and Control of Data Processing. *Richard L. Nolan.* National Association of Accountants, New York, 1977.

Measuring the efficiency and effectiveness of information systems in large organisations is crucially important. Vast sums are being spent on communications and data processing; but are they being spent wisely? Whilst our ability to monitor the cost-benefit of computer based operations is limited, our knowledge of the relationship between a message and the information of real value to a user is almost non-existent.

Professor Nolan's study is thus timely and relevant. The result of a four year research project, under the auspices of the National Association of Accountants, it sets out to explore the way companies are developing management control techniques to manage data processing activities.

The management control systems and chargeout procedures of 18 companies, mainly pairs from 9 diverse industries, provided the setting for the study. Interviews with senior management and with managers of data processing and user departments addressed a set of questions on chargeout systems. Questionnaires were also used to look at attitudes of user managers under different methods of charging out data processing costs.

Four broad conclusions are offered by the work:

- (a) That there is a trend towards organising data processing activities as stand-alone profit centres.
- (b) That many chargeout systems, used to pass on data processing costs to user departments as the basis for control, are ineffective. Only four percent of the user managers interviewed understood their charges well enough to control costs effectively.
- (c) That, if data processing activities are to be managed effectively, sound accounting systems to measure and charge out costs are necessary.
- (d) That a 'contingency approach' to data processing management control is the best way to develop a 'workable action plan'. This, the author explains, 'involves ascertaining the starting point or current status of the data processing activity and associated situational variables; next the desirable or ideal system must be identified; then the process of progressing toward the ideal can be formulated'.

The essential idea in Nolan's work is the Stage Hypothesis, which first appeared in the *Communications of the ACM*, Vol. 16 (7) in July 1973 and led to the well known *Harvard Business Review* article in

January 1974 'Managing the four stages of EDP growth'. The notion is that all organisations assimilate computer-based technology in an evolutionary fashion. Initially, applications seek cost-reductions; the emphasis in data processing is technological; controls are lax and users are told 'to keep their hands off'. Then applications proliferate; user-orientated programmers arrive on the scene; users become superficially enthusiastic; and management controls even more lax. Then a crisis occurs. There is an attempt to consolidate existing applications; controls are formalised and users held accountable. The fourth stage involves data-based on-line applications; the data processing organisation becomes tiered and is fitted into the organisation; formal management planning and control mechanisms are applied; and the user becomes effectively accountable.

The Stage Hypothesis does have an intuitive appeal. Organisations can be observed to evolve to higher orders of complexity; a number of significant companies have used Nolan's framework to assess their own progress and to highlight potential problems. But the 'stage hypothesis' is really a frame of reference, a way of relating events: it is not a hypothesis at all – even if it is graced with capital letters throughout the book. Consequently it is not surprising that the development of control methods should reflect a similar pattern.

The 'stage hypothesis' may treat organisations as more alike than they really are. The style of management practised by the chief executive, the structure of the organisation, the location of power, and the positioning of computing and the files, can be significant variables in the control of information systems. Darwin, after all, postulated a theory of biological evolution; he did not suggest that the Tyrannosaurus and the Galapagos turtle would develop by similar stages.

At the triennial IFIPS Congress in 1977, Nolan provided a paper which added two further stages of development, recognising the effects of data base technology. (Indeed your reviewer had the unusual pleasure of presenting this paper on the author's behalf and providing a critique, when an airline strike closed Toronto Airport.)

In the longer term, the orientation of this study towards data processing management may prove to be its real limitation. Already the issues are about the location and control of processing (systems architecture – stand alone minis or more centralised computing?), the location of files (who has rights of access to what?), and the relationship between the whole organisation's structure and style, and the shape of its information systems.

Nevertheless, in focusing on the organisation and

management control of data processing, the study does address some basic current issues. Not charging for data provided is to leave the user uninvolved, to allocate costs raises all the classical problems of full costs and marginal prices, and to treat as a profit centre requires a transfer price when there may well not be a market equivalent. Nor does the work lack the pragmatism to be expected of the Harvard Business School; some of the verbatim comments of users and DP Managers are particularly illuminating on the organisational implications of alternative approaches to control.

Unfortunately, and it seems inevitably, in research from North American business schools, the report itself is cluttered with the required rituals of academic trivia, making the real contribution difficult to uncover. To give some examples: the first chapter introduces the economic, behavioural and accounting foundations for the work. 'Fundamentally,' the author states, 'the control of data processing is an economic problem'; he then proceeds to demonstrate that price equilibrium, elasticity, scale economies, or supply and demand have little relevance in situations primarily human and organisational. Readers of a scholarly work should be expected to know the background literature. Then an attitude survey is conducted, with proper concern for statistical relevance, but to test a bland hypothesis. Then there is the prose! The thought that people are influenced by their past experiences as well as by present conditions should never be allowed to become: 'in addition to the situational variables a dynamic experientially based feedback process affects user/manager attitudes'.

But enough carping. Dick Nolan has conducted a worthwhile enquiry; sensibly has offered no panaceas but a highlighting of crucial issues which illuminate the frontiers of our ignorance. To appreciate the inadequacies of conventional management accounting and control methods, when applied to computer-based information systems, is to begin to perceive the potential of alternative forms of organisation and information.

Oxford Centre for Management Studies

R. I. Tricker.

Schmalenbach and After: A study of the evolution of German business economics. David A. R. Forrester. Strathclyde Convergencies, 1977. £4.50 hardback edition.

This book gives an account of the evolution of German business economics as it relates to contemporary accounting issues through the works by, and wrapped in a sparkling biography of, Eugen Schmal-

enbach (1873-1955), one of the founding fathers of this accounting school peculiar to Germany and some of its neighbours.

The author fuses the often-inspiring possibilities of biographical writing with a scholarly analysis of German business economics, that melting pot of business administration, financial-cost-and-management accounting, organisation and methods and finance, not to mention the main ingredient: micro-economics.

In the text, Schmalenbach, the likeable, self-made man, professor at Cologne, sticks out head and shoulders above many whose initial circumstances were much more propitious.

The author takes his reader with an ease occasionally spiced with anecdote and wit through the life of a man whose courage, at the height of his career, was severely tested by Nazism. Schmalenbach weathered the ugly storm without giving an inch of his *honnêteté intellectuelle*: his first publication in the Nazi era was dedicated to his Jewish wife, a loyalty he maintained throughout the Nazi regime, despite boycott and harassment.

Forrester presents the results of his exhaustive research and fieldwork in clear language, covering the colourful as well as day-to-day aspects of Schmalenbach's life and personality: his individual excellence, his pragmatism, his wide range of interests, his editorial productivity, his discipline, his near-obsession with substance over form, his social concern, his early appreciation for the thrust of 'small is beautiful', his strong sense of practical purpose. 'Both in consultancy and in academic research, Schmalenbach sought practical purposes, and tried to clarify uses and objectives. But these were necessary not to deduce some theoretical and optimal model, but for his emotional pragmatism. He thus saw that lofty goals were most talked of by authoritarian states, and sensed that perfect adaptation to immediate or rationalised functions could be a threat to further evolution.'

Although Forrester clearly admires his subject, this biography is no attempt at a revival of the 'cult of the person' favoured by the same authoritarian systems Schmalenbach himself so much abhorred. The prose is restrained, though there is the occasional poetic flight which some might find disconcerting: 'he [Schmalenbach] saw individual creative efforts almost as crests on advancing waves which he was more concerned to understand.'

Generally the author presents those characteristics and idiosyncrasies important to a proper understanding of the man's works with a conviction founded in a wealth of documentation and justified by the esteem in which this seminal thinker is held by

many in and outside Germany.

In organising his book the author has left ample room to facilitate comparison with traditional UK literature. The book is divided into the following chapters:

- (i) Introduction
- (ii) Schmalenbach the Man
- (iii) Commercial Education and Business Economics
- (iv) Practical Accounting
- (v) Dynamic Accounting
- (vi) Charts of Accounts
- (vii) Costs and Prices
- (viii) Finance, Capital and Labour
- (ix) And Beyond

The topical treatment is couched in historical terms, plausibly bridging and translating the issues important in the first half of this century with those in the spotlight of the second: inflation accounting, social accounting, objectives of financial statements, standardisation, investment theory, the need for a conceptual approach to accounting, the preferability of general principles over detailed standards, the behavioural aspects of accounting, and others.

The author elaborates on every topic, often linking it with 'before' and 'after' and illustrating his point by cross-national comparisons not limited to the US/UK context. The result is a revealing perspective on our present efforts, demonstrating in particular how much of the innovative thinking which we tend to attribute to our generation was, in fact, already conceptualised by Schmalenbach many decades ago.

Forrester takes some liberties in exploring vistas only peripherally related to the topics discussed. Considering the biographical nature of the book and its ambitious, wide-ranging objectives, however, this will disturb only the purists among his audience and will rather be felt as enriching by the less religiously utilitarian.

Forrester's epilogue (Chapter IX, 'And Beyond') is too condensed to enable the reader to clearly distinguish fact from personal preference, synthesis from rationalisation. But it is thought-provoking and, as such, provided it is read critically, makes a valuable contribution to the discussion of where to go from where Schmalenbach left off.

The book, published simultaneously with the 1977 Berlin and Munich International Conferences, will undoubtedly be instrumental in identifying and bridging basic cross-national differences in professional thinking patterns. Many not familiar with German-inspired business economics (which includes, e.g., the Limpergian tradition in The Netherlands) have difficulties in coming to grips with and seeing beyond the mystique surrounding this often seem-

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ingly dogmatic school of thought. The lack of clarity is due, at least in part, to the advocates of business economics themselves whose blinding enthusiasm in presenting their case to the rest of the world too often stops short of giving the whole truth, in the long run damaging the very cause they aim to serve. Forrester does not fall into this tempting trap. He is sometimes even clinically critical, blending the analytic and the biographic without raising the suspicion that his outspoken sympathy for his subject undermines his objectivity on the man's work.

The book is accessible to anyone with a relatively advanced knowledge of economics, accounting or business finance. It should prove interesting not only to students and teachers in comparative accounting and accounting history but to all anxious to avoid repeating accounting history. For a more in depth study of German business economics readers must be willing, however, to complement (with the help of the useful references to German literature in a brief introduction to most chapters as well as the comprehensive persons and authors index at the end of the book) the scope restrictions the author unavoidably had to set. Schmalenbach himself would not have required less.

'A well written life is almost as rare as a well spent one' wrote Thomas Carlyle some one hundred and fifty years ago. With *Schmalenbach and After* David Forrester comes close to showing us the best of both.

Waterloo, Belgium

Jules W. Muis.

Integrated Economic Accounting. H. Correa. Lexington Books, 1977. xix + 222 pp. £15.65.

The author states in his introduction that his book represents an integration of micro- and macro-accounting into a single structure using basic accounting principles. This objective is certainly achieved. The first part of the book consists of eight chapters dealing with accounts for different sectors of the economy. After the first introductory chapter, chapter 2 includes very basic principles such as descriptions of stocks and flows, the Balance Equation, assets and liabilities and their valuation, recording of transactions and income calculations. All of this is covered in nineteen pages. Chapter 3 extends the accounting treatment to the manufacturing process which is described in seven pages. Chapter 4 then extends the double entry framework to draw up a balance sheet and transactions statement from the personal sector and chapters 5, 7 and 8 then do the same thing for an industry as a whole. The first eight chapters are contained in 110 pages which

indicates that the treatment is not far short of terse. Essentially no more is done than to show very basic double entry principles applying to these different situations except that there is a slight diversion with a matrix model of deposit expansion in the chapter on the financial sector. There is no discussion of the practical problems of valuation of assets or income measurement. This section would only be of use to someone who knows nothing about double entry and who wanted a broad introduction to the subject. It would be inadequate for most undergraduates but could well be useful as 'first reading' in this area for them provided they were warned that this book only explains a technique for marshalling data, the observation of which in no way ensures that the statements are useful or mean what they appear to mean to laymen.

In chapter 9, Correa brings together the different sector aspects in order to construct a National Balance Sheet, and refers to National Wealth and National Capital. As the author of this review and others have argued elsewhere, developments in this area are badly needed. Few countries have national balance sheets and they have been shown to be a most relevant information basis for certain economic models. However, Correa does little to further this end. His discussion of the concept of National Wealth is limited to fifteen lines. The Royal Commission on the Distribution of Income and Wealth would be delighted to know it is all so easy. No doubt Correa is aware of the conceptual problems involved in these statements and chose to ignore them and concentrate on technique, but it is a great pity that at least no mention of the problems is made as a warning to readers.

Chapter 10 describes National Transaction Tables and in an appendix to the chapter Correa does show awareness of problems of treatment of some items but no discussion of problems is given; it is merely stated in a matter of fact way how the US accounts deal with such items.

The next chapter (11) provides something of a digression by developing a statement showing real and financial aspects and a generalised equation of exchange, but chapter 12 returns to the emphasis on transactions with a description of the Flow of Funds Accounts. Chapter 13 is a very abridged version of Input-Output Analysis. Chapter 14 develops a statement on Income and Product and another on Saving and Investment. The remaining chapters extend the accounting framework to modelling approaches for forecasting growth and various implications.

Correa says the book was written to find a logically consistent basis for macro-accounting. He has

certainly shown that the basic double entry framework used in micro-accounting can be extended to construct accounts for all economic sectors or countries *in toto*. This is hardly new, but the book does provide a 'macro-accounting made simple' text for those who need it and at this level it is quite good. However, I cannot see such customers paying £15.65 a copy.

In the concluding remarks, Correa also states: 'perhaps in a more remote way, this suggests that accounting in general, and micro-accounting in particular, should be better integrated with economic theory and that it is somewhat surprising that micro-accounting has been very little used by economists as a basis for gaining additional insight into the economic processes.' As an accountant who has also undertaken work of a social accounting kind I cannot but agree, but why was Correa satisfied to show this in a 'remote way'? The arguments can be made far more forcefully. In addition, in this reviewer's experience, economists often seem to hold accounting methods in low regard because of the valuation concepts underlying conventional accounts. Correa does nothing to help bridge this gap. In fact, the title of the book should be changed; it should be 'Integrated Economic Book-keeping'. The real problems of accounting are not concerned with statement construction, whether in conventional or matrix form. If economists were to follow Correa's plea and base more of their models (especially forecasting models) on accounting frameworks, they must also pay regard to appropriate valuation concepts for different purposes. Otherwise, one can expect such models to prove of little value and accounting methods to fall into lower regard. Fortunately, constructors of national accounts do, for the most part, consider the valuation bases carefully. One wonders, after reading Correa's book, how often the modellers simply take the accounting figures at face value without regard to the source and methods of the derivation of such figures.

University of Bath

Cyril Tomkins

An Autobiography. R. J. Chambers. International Centre for Research in Accounting, University of Lancaster. ICRA Occasional Paper No. 15, 1977. vi + 69 pp. £2.

Professor Chambers is an accounting theorist of international renown, a stimulus both to those who agree with his ideas and to those who disagree with them. This 'autobiography' provides not merely a list of his major books and articles but also annotations summarising their contents and often linking one to another to show the development of his ideas. There

is also an appendix summarising the rules of continuously contemporary accounting (CoCoA) and their justification as Chambers sees them in 1977, and what is called a 'limited' index but is in fact more detailed than many authors provide.

Chambers' active writing career goes back over 30 years to the first edition of his book *Financial Management* published by the Law Book Company in Sydney in 1947. His early articles – which the present reviewer perhaps rather perversely prefers to some of the later – were published in *The Australian Accountant*. Chambers' first publication outside Australia was a review article on Littleton's *Structure of Accounting Theory* published in the October 1956 *Accounting Review*. An article by Chambers ('Why Bother with Postulates?') appeared in the first volume of *The Journal of Accounting Research* in 1963 and he has published several articles in *Abacus* of which he was founding editor in 1965. His first publication in the UK appears to be the reprint of his 'Conventions, Doctrines and Common Sense' (written for the New Zealand Accountants' Journal in 1964) in Sidebotham's *Introduction to the Theory and Context of Accounting* (1965). His first article written specifically for a British audience was 'University Education in Accounting', published in *Accountancy* in July, 1967. He did not write for *Accounting Research* and it was not until Spring 1976 that an article of his appeared in *Accounting and Business Research*. These facts no doubt tell one more about the state of UK accounting than about Professor Chambers.

Chambers is best known for his espousal of 'continuously contemporary accounting' and the gradual development of his ideas can be traced through the bibliography. For example, the separation of monetary and non-monetary assets and the symbolic notation (M, N, L, R, P) for representing periodical positions and changes in position were introduced in his Australian Society of Accountants Annual Endowed Lecture in the University of Adelaide in August 1961. Replacement costs were

first rejected in a memorandum given a limited circulation in January 1963 and published in revised form in 1965. He himself has traced the development of continuously contemporary accounting in an introduction to the 1974 reprint of his classic work *Accounting, Evaluation and Economic Behavior*. The abbreviation COCOA was first used in the *Journal of Accountancy* in September 1975; it was Chambers' colleague Frank Clarke who suggested the form CoCoA. Chambers' contributions in other areas can also be traced. He has published important papers on accounting education, modern accounting history and group accounts. On the last he has contended in articles published in *The Australian Accountant* (1968 and 1974) that consolidated statements are not really necessary and that the use of the equity method in legal balance sheets conflicts with their function.

Few accounting writers have escaped Chambers' penetrating criticism. Littleton's *Structure of Accounting Theory* 'leaves a number of pertinent matters unexplained, and a number of the stated conclusions are indefensible on logical or practical grounds' (1956); 'many of the terms and "conclusions" ' of the Moonitz and Sprouse Studies on Postulates and Principles are 'vague or ambiguous' (1964); Edwards and Bells' proposals are 'inconsistent with the practical necessities of the users of financial statements' (1965); Grady's *Inventory* (ARS 7) is indicative of an 'anarchy or disorder . . . incompatible with the public and private interest in an informed securities market' (1966); the Sandilands Report has numerous defects: 'its methods, and therefore its results, are substantially and inevitably subjective' (1976).

The reviewer has had the good fortune to have known Ray Chambers for the last 18 years and like many others the development of his own ideas has been influenced by Chambers' many writings. In publishing this autobiobiography the author and ICRA have done a service to us all.

University of Exeter

R. H. Parker

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Volume 8 No 30 Spring 1978

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The Effect of a Merger on the Share Price of the Attacker

Paul Barnes

It is the purpose of this paper to consider what happens to the share price of the attacker during the period surrounding the event of a takeover or merger.

In Section I the hypotheses are set out. Section II discusses the findings and methodological aspects of previous studies. Finally, Section III records a study of share price movements for UK mergers which has been carried out by the writer.

I Related hypotheses

The efficient capital market hypothesis states that share prices should instantaneously adjust to new information. This has frequently been tested in relation to the informational implications of certain events.¹ Invariably, the conclusions are that share prices adjust rapidly to new information. Fama in an authoritative summary of the literature concludes:

In short, the evidence in support of the efficient markets model is extensive and (somewhat uniquely in economics) contradictory evidence is sparse.²

The perfectly competitive acquisitions market hypothesis states that competition will equate the expected rates of return on assets of similar risk. That is, the acquisitions market is not divorced from other asset markets and firms will rank takeovers with other possible investment projects. It has been shown that in such a market, in the absence of synergy, a merger will have a neutral effect upon the market

value of the attacker.³ The most rigorous proof of this is by Myers⁴ who lets X_{jk} be the vector describing the risk character of the combined firms J and K with contingent dividends of $J(s,t)$ and $K(s,t)$ respectively. Therefore, if diversification is the reason for the merger and there are no expected benefits or economies:

$$X_{jk} = \frac{S_j}{S_{jt}} X_j + \frac{S_k}{S_{jk}} X_k$$

where $S_j = \sum J(s,t)$ and $S_k = \sum K(s,t)$.

As X_{jk} is in the cone spanned by X_j and X_k , investors could obtain portfolios containing the risk characteristics $X_r = X_{jk}$, irrespective of whether the merger took place. The cost of such a portfolio therefore is

$$\mu_r = \frac{S_j}{S_{jk}} \mu_j + \frac{S_k}{S_{jk}} \mu_k$$

Assuming X_j and X_k are not unique and may be obtained in other securities

$$\mu_{jk} = V_{jk} / S_{jk} = \mu_r$$

where V_{jk} is the market value of the merged firm.

Therefore $V_{jk} = V_j + V_k$

If X_j and X_k are unique a similar conclusion may be obtained by considering the effect of the merger upon supply and demand within a market in equilibrium. $V_{jk} > V_j + V_k$ only if there is an excess demand for shares in the merged firm. Since the merger is the only change imposed upon the pre-merger equilibrium position, the excess demand can only come from J and K shareholders. Expected utility cannot have been changed by the merger, otherwise

¹For example, Fama, E. F., et al, 'The Adjustment of Stock Prices to New Information', *International Economic Review*, February 1969, pp. 1-21 study stock splits; Ball, R. and Brown, P., 'An Empirical Evaluation of Accounting Income Numbers', *Journal of Accounting Research*, Autumn 1968, pp. 159-178 study annual earnings announcements, and Scholes, M. S., 'A Test of the Competitive Hypothesis: the Market for New Issues and Secondary Offerings', unpublished PhD thesis, Graduate School of Business, University of Chicago, 1969, studies new issues and large block secondary issues of stock.

²Fama, E. F., 'Efficient Capital Markets: A Review of Theory and Empirical Work', *Journal of Finance*, May 1970.

³Levy, H. and Sarnat, M., 'Diversification, Portfolio Analysis and the Uneasy Case for Conglomerate Mergers', *Journal of Finance*, September 1970, pp. 795-802.

Myers, S. C., 'Procedures for Capital Budgeting under Uncertainty', *Industrial Management Review*, Spring 1968, pp. 1-19.

⁴ibid.

there would have been incentive to investors to change their holdings in J and K before the merger which is inconsistent with the assumption of equilibrium.

Levy and Sarnat arrive at a similar conclusion: that the improved risk-return combination achieved by the merger of two unrelated variable income streams could be achieved by investors without the merger.⁵ They prove that the optimal proportion of investment after the merger is the same as the proportions which were invested in the individual companies prior to the merger. Thus, the merger does not cause supply and demand forces to change the state of equilibrium within the market.

A distinction must be made between the impact upon aggregate market value and upon the attacker's share price. If $V_{jk} = V_j + V_k$, where $V_j = n_j P_j$, $V_k = n_k P_k$ and the terms of the merger are $\Delta n_j P_j' = n_k P_k + C$, so that $V_{jk} = (n_j + \Delta n_j) P_j'$, where P_j , P_j' represent the share price immediately before and immediately after the merger, n the number of shares, and C represents a premium to the shareholders of K as an incentive to accept the takeover, then $n_j P_j' < V_j$ and $P_j' < P_j$. Thus the share price of the acquirer may remain the same – or fall if the market considers the consideration for the acquiree to be too high.

The second construction of the perfectly competitive acquisitions market application lies in the original assumption of the absence of synergy. Various arguments have been made to the effect that even if there are no operational economies to be expected from a merger, there are still financial benefits arising from a reduced future cost of capital.⁶ As a consequence, the notice of a merger may be regarded as 'good news' and an increase in the share price of the acquirer may be expected. If F represents the present value of the discounted future financial benefits of the merger, $V_{jk} F + V_j + V_k$ and $C = 0$, $P_j' > P_j$. The relationship between C and F therefore becomes critical. That is, if $C > F$ then $P_j > P_j'$ and if $C = F$, $P_j = P_j'$, and if $C < F$, $P_j < P_j'$. Simply, if the market considers the premium paid to the shareholders of the acquired company to be less than the benefits arising from the merger, the share price of the acquirer will fall. Similarly, there will be a rise if the market values the benefits above the premium.

⁵ibid.

⁶Barnes, P. A., 'The Purely Financial Case for Takeovers', *Management Accounting (UK)*, December 1976; Renshaw, E. F., 'The Theory of Financial Coverage and Conglomerate Mergers', *California Management Review*, Fall 1968, pp. 79–84; Llewellyn, W. G., 'A Pure Financial Rationale for the Conglomerate Merger', *Journal of Finance*, May 1971, pp. 521–535.

II Previous empirical studies

The impact of a merger on the share price of the attacker has been studied occasionally in recent years. It is the purpose of this section to review the hypotheses on which these studies are based, the methodology used, and the findings.

Block studied 35 randomly selected mergers of companies quoted on the New York Stock Exchange (NYSE) between 1961 and 1965.⁷ He did not hypothesise as to whether there should be upward or downward movements in prices, but attempted to identify the period in which there was significant movement as a test of the efficient capital market hypothesis. Results of the test are given in Table 1. His statistical method was a two-tailed Z-value test of the normal distribution. The null hypothesis was that the average share price movement equals zero. The only significant statistic (at the 0.05 level) is for the period between six and nine months prior to the announcement of the offer which is evidence of (a) the efficient capital market hypothesis and (b) that merger news is in fact considered to be 'good'. If the statistic of +1.7 is also to be taken as significant it may be further hypothesised that not all the good news of a takeover is discounted at such an early date.

Table 1

Z Values for the null hypothesis that the average share price movement equals zero: Block study

Period	Z Value
Prior to announcement of offer	
– 9 months to – 6 months	+ 2.06
– 6 months to – 3 months	– 0.87
– 3 months to – 1 month	+ 1.70
– 1 month to announcement	+ 0.82
Announcement to + 1 month	– 0.06
+ 1 month to + 2 months	+ 0.39
+ 2 months to acceptance	+ 1.02
Acceptance to + 1 month	+ 0.22

Significant Z value ∓ 1.96 at 0.05 level of significance and ∓ 1.64 at 0.10 level of significance for the two-tailed test.

⁷Block, S. B., 'The Merger Impact on Stock Price Movements', *Business Topics*, Spring 1969; and Block, S. B., 'The Effect of Mergers and Acquisitions on the Market Value of Common Stock', Unpublished PhD Dissertation, Louisiana State University and Agricultural and Mechanical College, 1968.

An alternative method of analysis is the use of a regression model. Mandelker tested for the period November 1941 to August 1962 stock prices of all acquirers of companies quoted on the NYSE.⁸ The following model was used: $\hat{\epsilon}_{jt} = R_{jt} - \hat{\gamma}_{0t} - \hat{\gamma}_{1t} \beta_{jt}$ where $\hat{\epsilon}_{jt}$ is the residual or abnormal performance of stock j at month t , and β_{jt} represents the relative risk of asset j at time t which is re-estimated by least squares for each stock by using the last 60 monthly rates of return up to month t .

$\hat{\gamma}_{0t}$, $\hat{\gamma}_{1t}$ are least squares estimates of market determined variables representing the *ex post* relation between rates of return and risk at time period t , and R_{jt} is the percentage rate of return on security j during period t .

The estimating procedure is a characteristic of the model that attempts to account for possible changes in risk. Residuals $\hat{\epsilon}_{jt}$ are averaged for each month and cumulated over the progress of the months surrounding the merger. The results show that merger news is good and that this is reflected in the share price over approximately thirty months before the event. A significance test of the residuals differing from zero was made. The t -statistics are too small to be significant, causing Mandelker to finally conclude that "news" of an acquisition may not be worthwhile news, since no abnormal behaviour is in fact observed.⁹

Finally, Michael Firth has recently tested a simpler model for takeovers on the London Stock Exchange:⁹

$$U_{jt} = R_{jt} - \beta_{jt} R_{m,t}$$

where R_{jt} is the proportionate change in the share price of security j in time period t , and $R_{m,t}$ is the actual return on the FT index in the same period. In this respect Firth hypothesised that for the period leading up to the bid there should be an increase in the share price of the attacker where equity was the consideration. This is the result of 'pre-arranged buying support'. Further, Firth suggests that in the period immediately following the bid there should be a fall in the share price because of the withdrawal of support and because investors, who had not been expecting a bid, considered that the price was too large.

The assertion of share price support by institutional buying in the period leading up to the bid would surely be disputed and in fact represents a breach of the City Code. It is unfortunate that only the 30-day period leading up to the bid was considered as

previous studies show that it is in earlier periods that share prices anticipate the 'good news' of a forthcoming takeover.¹⁰ The results of the study provide tentative evidence for the hypothesis (for the 30 days leading up to the bid, there were 18 positive U_{jt} values for the equity consideration bids, giving a net increase in value of 3.3%. This compared with an 8.4% fall for the 30 days following the bid). It has not been determined, however, whether such variations from the market are merely random or are in fact statistically significant.

In general terms it may be concluded that there is some consensus on the method of analysis. Additionally, there is some evidence that merger news may, in fact, be considered 'good' and is probably reflected in the abnormal performance of the share compared with the market at an early stage.

III A UK study

All mergers between June 1974 and February 1976 – 39 in all – of companies quoted on the London Stock Exchange were tested for significant price changes between the events:

- 1 Nine months before the announcement of the offer
- 2 Six months before the announcement of the offer
- 3 One month before the announcement of the offer
- 4 The announcement of the offer
- 5 The declaration of a successful offer
- 6 One month after the declaration of a successful offer

The data are given in the Appendix.

Indexes of relative price changes were then determined for each company according to

$$X_1 = \frac{P_{x1t}}{P_{x1t'}} \text{ and } X_2 = \frac{I_{x2t}}{I_{x2t'}}$$

where X_1 = relative price change index for the acquirer

X_2 = relative index change index for the comparable sector FT actuary

The relative price changes were averaged and compared with the average relative price change of the control group:

$$D = X_1 - X_2$$

$$\bar{X}_D = \sum D/n$$

The average difference \bar{X}_D was then tested as the mean of an average sample of a population with a mean of zero. The null hypothesis, $\mu = 0$, was

⁸Mandelker, J., 'Risk and Return: Merging Firms', *Journal of Financial Economics*, Vol. 1, pp. 303–335.

⁹Firth, M., *Share Prices and Mergers*, Saxon House, 1976, pp. 142–173.

¹⁰Block and Mandelker, *op. cit.*

tested at a .05 level of significance. Z then was taken as

$$\frac{\bar{X}_D - 0}{\sigma/\sqrt{n}}$$

$$\text{where } \sigma = \sqrt{\frac{\sum D^2}{n} - \left(\frac{\sum D}{n}\right)^2}$$

Because of interest in movements in both directions the two-tailed test was preferred. If Z exceeded 1.96 standard deviations, the null hypothesis was rejected. (This test is similar to that carried out by Block except that stabilisation is by the relevant FT actuary rather than a comparable non-merging company.) The Z values for the null hypothesis (that there is no significant difference between average changes in the share prices and actuaries indices) are given in Table 2.

Table 2

Results of the study of UK share price movements

<i>Period</i>	<i>Z Values</i>	\bar{X}_D
Prior to announcement of offer		
- 9 months to - 6 months	+ 0.787	+ 3.072
- 6 months to - 1 month	- 0.139	- 0.810
- 1 month to announcement	- 0.298	+ 0.759
Announcement of offer to acceptance	+ 1.698	+ 4.380
Acceptance to + 1 month	- 1.817	- 4.069
- 9 months to announcement of offer to acceptance	+ 1.564	
- 9 months to announcement of offer to acceptance + 1 month	+ 1.189	

Significant Z value ∓ 1.96 at 0.05 level of significance and ∓ 1.64 at 0.10 level of significance for the two-tailed test.

approach significance. In fact, the later period is significant at the 0.1 level indicating that share price falls against the index. The conclusion from these results is that there are no significant movements against the index, although there is some evidence to suggest that merger news is in fact 'bad', causing investors to revise their expectations downwards upon the acceptance of the offer.

The average price changes against the index, \bar{X}_D , represent abnormal performance percentages and are listed in Table 2. They show that although the results are not quite statistically significant for the period concerned there were in fact rises of 3% between 9 months and 6 months prior to the announcement and 4% between the announcement of the offer and its acceptance. This was then followed by a 4% fall in the following month.

IV Summary and conclusions

Portfolio theory would suggest that in the absence of any synergistic benefits the share price of the attacker will remain the same. It has been shown that there are two other factors which determine the movement, assuming efficient capital markets. They are the premium to be paid as an incentive to the shareholders of the victim of the takeover and the benefits to be derived from the merger. Whether there is a net benefit or cost, or, to be more correct, whether investors consider there to be a net benefit or cost, determines whether there is a share price increase or decrease.

Studies in the USA have indicated increased share prices as a result of a merger. These occurred at an early stage during the period surrounding the merger. The results of the study carried out by the writer, although not quite statistically significant, along with the results of another UK study, indicate a contradictory pattern on this side of the Atlantic. That is: small price increases leading up to the merger and relatively large price decreases immediately afterwards.

Acknowledgement

The writer wishes to thank Professor T. W. McRae of the University of Bradford for his helpful comments.

The results are again less than conclusive showing that it is only for the period between the announcement of the offer and acceptance and between acceptance and one month later that the Z statistics

APPENDIX
Attackers' Share Prices and FT Actuaries Indices

		— 9 months	— 6 months	— 1 month	Offer	Accep- tance	+ 1 month	
1	Bentos	price	31	52	34	42	42	37
	— Wright, Bridley, Gell	index	106.98	196.90	110.96	138.60	138.73	121.10
2	Adwest	price	73	61	128	120	118	100
	— S M C	index	62.24	56.01	103.93	110	99.04	92.11
3	Eagle Star	price	100	55½	58	87	101	132
	— Grovewood Sec	index	79.70	56.86	54.96	74.09	81.72	107.59
4	Illingworth Morris	price	28	18	12	19	19½	15
	— Mallinsons	index	133.84	108.59	63.79	107.33	135.66	119.73
5	Bears	price	42½	30½	25	20½	20	35
	— Gathford Estates	index	145.09	153.85	84.53	70.68	65.06	100.11
6	Lloyds & Scottish	price	72	67	55	23	32	25
	— British Relay	index	284.29	237.02	172.07	88.28	74.84	52.76
7	Charterhouse Group	price	88	67	53	41	33	33
	— Charterhouse Inv. Trust	index	200.8	139.48	110.60	86.82	68.45	59.04
8	Berry Wiggins	price	118	144	134	101	99	82
	— KCA	index	257.07	275.76	223.34	190.90	192.00	159.16
9	Tube Investments	price	272	220	152	122	231	242
	— Midland Aluminium	index	90.1	82.2	58.2	46.1	81.6	87.3
10	Croda	price	60	51	71	92	70	55
	— Midland Yorkshire	index	123.4	92.6	142.5	137.0	176.4	156.2
11	Reed International	price	207	147	216	192	280	265
	— Walker Crosswellen	index	71.6	54.4	85.6	82.7	99.4	101.9
12	Johnson, Firth Brown	price	45	39	40	34	40	42
	— N. Greening	index	125.3	116.1	107.1	90.4	153.3	151.1
13	SGB	price	80	91	33	59	45	49
	— Contractors Service Group	index	176.3	187.8	98.0	94.3	82.9	106.1
14	Tootal	price	34½	36	22	18½	15	16
	— Tritex	index	124.7	127.4	84.3	80.6	64.7	63.6
15	Pilkington Glass	price	263	270	160	158	100	168
	— Kitson Insulation	index	98.7	110.8	65.8	64.7	48.2	79.7
16	GEC	price	129	114	76	75	57	52
	— Geo. Kent	index	125.3	108.8	87.9	86.5	84.0	67.4

APPENDIX *continued*

17 Gibbons Dudley	price	44	46	15	16	16	13
— Henry Foster	index	110.0	111.7	73.9	61.6	60.4	48.9
18 Furness Withey	price	141	113	109	105	111	140
— Economic Insurance	index	381.2	331.4	258.4	213.7	254.9	226.4
19 Cosalt	price	108	58	54	54	38	35
—Orbit	index	178.1	89.9	74.6	77.4	62.1	51.2
20 Newman Industries	price	37	34	38	35	34½	33
— Lindop	index	158.6	134.9	82.2	59.8	56.4	46.8
21 Leonard Fairclough	price	208	94	99	86	72	100.6
— Sir Lindsay Parkinson	index	290.5	176.3	149.2	133.6	101.8	78
22 Greef Chemicals	price	58	48	56	47	46	48
— Chemical Securities	index	159.1	143.3	145.9	120.9	100.9	98.0
23 International Nickel	price	15	13½	21⅞	20¼	18⅞	20¼
— Daniel Doncaster	index	323.1	372.2	461.5	402.6	359.2	391.0
24 Northern Foods	price	55	69	72½	77	78	84½
— Clover Dairies	index	127.82	146.79	165.83	160.09	167.96	169.79
25 Barrett Development	price	95	89	120	126	128	116
— H. C. James	index	177.20	170.14	153.09	186.41	191.72	180.11
26 RHP	price	36½	62	59	69½	66	74½
— MTE	index	33.09	48.62	42.88	49.28	51.82	55.35
27 Bentos	price	28	45	37	42	41	51
— Marshall, Morgan & Scott	index	101.96	123.06	133.25	147.83	144.99	160.66
28 Mathews Holdings	price	40	49	46	48	41	42
— Dawson & Barfos	index	102.65	135.63	143.54	161.59	161.05	164.29
29 BTR	price	36	82	121	142	150	153
— Permal	index	64.25	116.79	114.35	128.37	150.50	147.79
30 Courho	price	80	119	123	117	109	115
— C. Roberts	index	65.72	114.38	136.10 209.02	212.46	208.72	210.12
31 Howden-Stuart	price	39	24	44	60	38	38
— A. Gunn	index	110.94	72.97	235.92	230.43	172.87	219.90
32 Whitbread	price	38½	34	64	64	53	57
— Long John	index	89.51	74.58	146.91	155.35	133.63	146.87
33 Spirella	price	27½	25½	42	39	43	49
— Vantona	index	81.03	89.22	124.28	122.38	144.22	144.19

APPENDIX continued

34	Stone Platt	price	41	39½	67½	60½	77	91
	– E. Scragg	index	86·11	92·60	134·65	131·08	151·85	161·05
35	Lonrho	price	51	75	145	125	120	101
	– London Australian & General	index	77·25	69·44	135·88 226·10	219·55	210·93	200·34
36	Wm. Mallinson	price	12½	14	34½	27	30	33
	– NET	index	66·19	58·98	101·54	93·35	103·98	120·38
37	Sketchley	price	31	38	63½	57	62	64
	– Quality Cleaners	index	82·53	87·18	126·31	125·22	137·64	153·57
38	GEI	price	28	34	42	42	43	51
	– Toberail	index	61·09	70·6	101·83	91·60	108·18	109·85
39	Astra Sec	price	9½	12	11½	12	12½	14½
	– Zinc Alloy	index	62·15	72·12	96·12	93·49	118·52	118·55

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Segmental Disclosures by Multibusiness Multinational Companies: a Proposal

C. R. Emmanuel and S. J. Gray

Introduction

The Companies Act, 1967¹ requires UK companies to disclose the turnover and profit (before tax) of the substantially different classes of business in which they are engaged. The Stock Exchange Listing Agreement² also requires a geographical analysis of turnover and profit before tax. These disclosure requirements are supported by the EEC³ and the OECD.⁴ However, none of these documents defines a segment and, in the case of the British legislation, this task is delegated to the directors of the companies concerned.

This paper attempts to indicate the deficiencies of the current segmental disclosure requirements in the UK and refers to empirical evidence which reveals the wide variety of practices presently being followed. The alternative bases of identifying segments are examined and, finally, a proposal to promote the recognition of reportable segments is made. At this stage, the primary concern of the research is related to the feasibility of *identifying* reportable segments and not with the information content of the disclosure requirements. This latter aspect would seem to be of secondary importance whilst companies are in a position to consciously or inadvertently manipulate the means of identifying segments in order to avoid or minimise disclosure.

The need for segmental disclosure

Several empirical studies of user needs support the disclosure of financial information by segments. A sample of financial analysts, commercial bankers and government agencies in the USA⁵ indicated that there was an important need for information about the operating results of major segments of diversified companies. In particular the sales and contributions to company profit are wanted so as to forecast consolidated profits, and are also needed to appraise the success of the management of the company. A later study⁶ found that financial analysts attempted to disaggregate consolidated information even when they felt that the information available was less than was needed to perform the task adequately. British studies⁷ have also found that certain groups of external users (viz. financial analysts, bankers) regard the provision of effective segmental disclosure as being of prime importance. More recently, *The Corporate Report*⁸ has approved the concept of disaggregation and has drawn attention to the need for a generally applicable and practical basis for disaggregation. This has been supported by the Department of Trade in its recent Green Paper *The Future of Company Reports* where it is stated that the existing legal requirement 'has not worked well because it leaves too much to the discretion of

¹The Companies Act 1967. Section 17 relates to disclosure of turnover and profit by class of business. Section 20 relates to disclosure of exports in terms of turnover.

²Stock Exchange Listing Agreement - Companies. Paragraph 9 (b) requires a geographical analysis of turnover and profit (before tax).

³Commission of the European Communities, *Proposal for a Fourth Council Directive for Coordination of National Legislation regarding the Annual Accounts of Limited Liability Companies* (Brussels, 1974) Article 40; *Proposal for a Seventh Directive concerning Group Accounts* (Brussels, 1976) Article 20.

⁴Organisation for Economic Co-operation and Development, *International Investment and Multinational Enterprises* (Paris, 1976) pp. 14-15.

⁵Backer, M. B. and McFarland, W. B., *External Reporting for Segments of a Business* (New York: NAA, 1968) pp. 6-14.

⁶Mautz, R. K., *Financial Reporting by Diversified Companies* (New York: Financial Executives Research Foundation, 1968) chapter IV.

⁷Peasnell, K. V., *The Fundamental Nature and Purposes of Published Accounts of Companies, with particular reference to the needs of users and potential users*, unpublished Ph.D. thesis (University of Lancaster, 1975) Appendix 1, Table 4 and Nicholson, J., 'Why Annual Reports Misfire', *Management Today*, December, 1971.

⁸Accounting Standards Committee, *The Corporate Report* (London, 1975) paragraph 6.51.

directors and as a result the information disclosed has been of only limited value'.⁹

The need for information on a segmental basis by a large section of the external users of annual accounts would appear to be significant. Financial analysts need separate sales and profit figures for segments in order to understand the business, to make forecasts of consolidated profit and to appraise management's diversification strategy. The primary characteristic which makes a segment significant to investors and creditors is homogeneity in the effect of economic conditions on earnings.¹⁰ This implies that reportable segments should have differing rates of profitability, growth and risk over time. Thus activities should be grouped together if their earnings respond to changes in economic conditions in the same way.

Alternative bases for identifying segments

Several bases are available for identifying segments. The company may be segmented in terms of the industries in which it operates, the product lines or services offered, the markets served, or the geographical areas in which it is involved. Alternatively the segments may be identified in accordance with the organisation structure of the enterprise such as by division, department, branch or subsidiary. We will examine each of these alternatives and will introduce empirical evidence¹¹ from our earlier research to assess whether they are feasible in the light of present-day UK disclosure practices.

Industry and Product Line

The distinction between industry and product line is blurred in practice because industrial classification reflects an aggregation of related products and services. Sometimes the industry and product bases will identify segments consistently as in the case when a company produces tobacco and paint. Conversely, if the company produces paint and soap products, only one industry segment may be recognised or two product segments.

The Standard Industrial Classification in the UK categorises establishments according to industry. The authors found from a study of the disclosure practices of the 100 largest UK industrial companies that of the

78 companies providing a full or partial analysis of sales and/or profits by segments, only 11 were not at all consistent with the SIC Order Level (1 digit), whilst 25 were not consistent with the SIC Minimum List Heading Level (3 digit). The number of companies which were only partially consistent also increased as the more specific industrial classification was applied. Therefore the SIC broadly accorded with the way in which the majority of the participating companies identified and disclosed segment information.

Further information about the activities of a company can usually be found elsewhere in the annual report. For example, there is a legal requirement to disclose the principal activities and a listing of subsidiaries.¹² Increasingly, annual reports illustrate the organisation structure and managerial responsibilities within the enterprise and an indication of activities is also given in the presentation of the Chairman's Review. These supplementary sources were used in comparison with the SIC to gauge whether the legal requirement of segmental disclosure could be improved. At the SIC 1 digit level, all but 2 of the 78 companies concerned could have disclosed segments consistent or partially consistent with this classification. Only 5 companies could not have complied with the SIC at the 3 digit level as judged by the supplementary information available.

The practice of minimum disclosure was highlighted in the case of the 22 companies which did not comply with the legal requirement imposed by the Companies Act. The Chairman's Review or Directors' Report of 19 of these companies suggested that segment disclosure was appropriate and that a single class of business was not being operated. At the SIC 1 digit level, all of these companies could have disclosed more than one industrial activity.

Before the implications of these findings are examined, the stringency of the analysis must be questioned. Firstly, the companies which could have identified more industrial segments than they actually did may argue that the activities are co-ordinated centrally. As a result the companies are not truly diversified but have a single dominant product. A second line of argument relates to the accuracy of the SIC itself and whether it reflects distinct, industrial activities. There is also the difficulty that the SIC relates to establishments which may or may not be consistent with the individual company's organisation.

Further research and up-dating of the SIC is necessary to refute or substantiate these latter arguments. In respect of the first point, the authors are aware of the problem of central co-ordination

⁹Department of Trade, *The Future of Company Reports*, Cmnd 6888 (HMSO, 1977) paragraph 39.

¹⁰Backer, M. B. and McFarland, W. B., op. cit., pp. 21-2.

¹¹Emmanuel, C. R. and Gray, S. J., 'Segmental Disclosures and the Segment Identification Problem', *Accounting and Business Research*, Winter 1977. The empirical evidence is drawn from the 100 largest quoted industrial companies ranked by turnover in *The Times* 1000, 1975/76.

¹²*The Companies Act* 1967, Sections 16 and 3 respectively.

across industrial boundaries and have adopted a conservative view in categorising these firms. Broad categories such as wholesaling, manufacturing, retailing are regarded as indicators of functional activities unless specifically linked to separate products or services.

Notwithstanding these arguments, the evidence suggests that the practice of reporting by industry or product line is widespread. The supplementary information relating to industrial and product line activities suggests that the quality of this disclosure can be improved and the potential confusion resulting from a seeming mis-match of the legal disclosure and the other information contained in the annual report may thereby be avoided. However, those companies which did not disclose on an industrial basis may have adopted an alternative basis, such as by the markets served.

Markets

It can be argued that different markets have different degrees of risk attaching to them and hence the use of markets as the basis of identifying segments is suggested. The dependence of a company upon a single or a relatively small number of customers, or a particular industry or a government agency as major purchasers of the firm's product may be particularly useful information for investors, creditors and analysts. But only 3 companies in the survey supplied sufficient information to indicate that they did or could segment their activities on this basis. Hence the practicability of such an approach seems doubtful though its desirability remains an open question.

Geographical Area

As regards geographical segmentation it was discovered that only one of the companies in the authors' survey provided no disclosure by geographical area because, in fact, no overseas operations existed. Twelve provided no analysis without any comment at all and a further 12 companies disclosed a partial analysis on a UK/Overseas basis only. A mixed analysis was disclosed by 9 companies where turnover may be segmented on a country or continental basis but profit information was disclosed on a UK/Overseas basis only. Therefore 66 companies disclosed financial information by country or continent. Practice relating to partial or full analysis varied within this group.¹³ Whilst the majority identified geographical segments by continent, a significant number, 17 companies, aggregated continents and a further 7 mixed continents and countries in their presentations of the analysis.

Again the supplementary information about geographical areas was examined and compared with the actual segmental disclosure. For those companies providing an analysis by geographical segments, only 27 were consistent with the categories presented in the Directors' Report or Chairman's Review; whilst only 15 were consistent when the comparison was made with the grouping of subsidiaries information. Of significance is the fact that only 52 per cent of the total number of companies sampled disclosed both turnover and profit information for the UK as distinct from overseas performance. But, as emphasised by the Department of Trade, information about the geographical location of a company's business and its contribution to trading results is 'important for a true appreciation of its financial situation and prospects'.¹⁴

Organisational Lines

The identification of segments consistent with the company's subsidiaries, divisions, departments or branches offers an alternative basis for disclosure. However, when the organisational unit does not coincide with an industry, product line, market or geographical area, disclosure by this means may be regarded as inconsistent with the needs of external users. The managerial responsibilities highlighted in the internal accounting system may be of dubious worth when reporting for external users. Product lines or markets assigned to a division may not be homogeneous in terms of risk, profitability or growth.¹⁵ Divisions or legal entities may be created for other than economic reasons, for example to take advantage of provisions in tax laws.¹⁶ If a division of a company is producing ice cream and ball-bearings, the previous arguments call for a product line segmentation because this would provide relevant information for external users. But there is a difficulty with this line of reasoning. For it implies that user needs can be satisfied without regard to the way in which the company is managed.

There are several reasons why a company may consciously combine diverse activities under a single manager's responsibility. Firstly, the products concerned may have a common demand elasticity and are therefore treated as a single activity. Secondly, the products may use joint production facilities making separation of the activities meaningless for control purposes. Thirdly, one of the activities or

¹⁴Department of Trade, op. cit., paragraph 40.

¹⁵Backer, M. B. and McFarland, W. B., op. cit., p. 20.

¹⁶Financial Accounting Standards Board, *Financial Reporting for Segments of a Business Enterprise: Discussion Memorandum* (Connecticut, 1974) paragraph 59.

¹³Emmanuel, C. R. and Gray, S. J., op. cit., p. 19.

products may dominate the others to the extent that diversification is superficial. Fourthly, the activities may be sequentially or reciprocally interdependent and separation would involve inter-segment transfers which are substantial in terms of volume and value. This list is not exhaustive but serves to indicate that there may be tenable managerial arguments for placing seemingly diverse activities under the control of one man. The needs of the external users for product line or industry segments will not be effectively served if, for example, the breaking up of an organisational unit involves substantial allocations of common costs. Nor will the reportable segments reflect the strategy and philosophy which the company is following. The need to report for segments which display differences in risk, profitability and growth profiles is not denied by these arguments but the real problem is to determine who is in the best position to gauge these differences. Solomons¹⁷ argues that if the internal accounting reports are 'the best that management can produce to guide their own decisions, then there is an initial presumption that the same statements, or less detailed versions of them, are likely best to serve the investor in making his investment and dis-investment decisions.' In fact, segmental disclosure on other than organisational lines can misguide the external users as to the extent to which the company is actively following a diversification

strategy. The inconsistency of the argument favoring the needs of external users to the exclusion of managerial realities is indicated by the conclusions of the Backer and McFarland and FASB documents where it is ultimately recognised that the management of a company is best placed to define the segments on which to report.¹⁸ If the organisation structure reflects the way in which the company is being managed in response to its product/market environment, should not segmental disclosure be required on a basis consistent with this situation? If this is accepted then the identification of segments which exhibit homogeneity with regard to the effect of economic conditions upon results should be a managerial prerogative verified by the company's organisation structure.

Interestingly, the survey of disclosure practices showed (see Table 1) that 77 companies provided information sufficient to identify their organisation structures, some of which gave the names of the managers responsible for the individual divisions or subsidiaries. The majority of these companies indicated that their organisational units are organised on a basis broadly consistent with the SIC.

All of the alternative bases for identifying segments outlined here have some relevance in practice. In fact a combination of bases may provide the most meaningful presentation. For example, 18 companies illustrate

¹⁷Solomons, D., 'Accounting Problems and Some Proposed Solutions', in A. Rappaport, P. A. Firmin, and S. A. Zeff (editors) *Public Reporting by Conglomerates* (Prentice-Hall, 1968).

¹⁸Backer, M. B. and McFarland, W. B., op. cit., p. 100 and Financial Accounting Standards Board, *Financial Reporting for Segments of a Business Enterprise, Statement of Financial Accounting Standards No. 14* (Connecticut, 1976) paragraph 12.

TABLE 1
Segmental disclosures: identification of the company's management organisation structure from supplementary disclosures provided in the company report

<i>Organisation Structure</i>	<i>Business Dominated</i>	<i>Geographically Dominated</i>	<i>Mixture of Business and Geography</i>	<i>Functional</i>	<i>Total Companies</i>
<i>Supplementary Disclosures</i>					
Explicit	17	6	23	2	48
Indicative	8	7	13	1	29
Total Identified	25	13	36	3	77
Indeterminate					23
Total Companies					100

TABLE 2
Matrix analysis: segmental disclosure of business and international activities in matrix form

Full Matrix	Business Oriented Matrix		Internationally Oriented Matrix		No Matrix	Total Companies
	Full	Partial	Full	Partial		
1	—	6	3	8	82	100

their segments' results by means of a matrix (see Table 2) where industrial and geographical classifications form the axes. Amongst those companies which comply with the legislation, the disclosure of segments by industry or product line, or by organisational lines seems to be most popular. Segmental disclosure by geographical area also seems to be feasible in practice and is generally given in addition to a business analysis. However, a tightening of the disclosure requirement along these lines is unlikely to be universally acceptable because the ways of identifying segments do not incorporate any measure of materiality.

Materiality and segmental disclosure

The provision of segment reports based on product lines would involve some companies in producing literally hundreds of additional financial statements. The costs incurred in this exercise are unlikely to be outweighed by the subsequent benefits to external users partly because of the user's inability to assimilate and understand the mass of information which would then become available. Hence a significance criterion must be found.

The present UK legislation allows the directors' opinion to determine whether or not the financial results of a segment are material and therefore worthy of disclosure. The question of what is a *substantial* contribution to sales or profits is open to wide interpretation. In the USA, the recent *Statement of Financial Accounting Standards No. 14*¹⁹ defines a reportable segment as one which contributes 10 per cent or more to combined revenues, operating profits or losses, or identifiable assets. However, a practical limit of 10 reportable segments is seen as generally appropriate for disclosure purposes. In Canada, the SIC is the means of identifying segments and a quantitative significance criterion is then applied to

isolate reportable segments. The North American approach is therefore more prescriptive than that embodied in the UK legislation but it is not without its shortcomings.

Firstly, the quantitative significance criteria which determine whether a segment is material and therefore requires disclosure are arbitrary. Secondly, the American Standard requires back-up rules to ensure that the reportable segments identified reflect a substantial proportion of the consolidated results. These rules are sometimes inconsistent and may lead to alternative interpretations being applied.²⁰ Finally, the quantitative significance criteria do not eliminate the use of managerial discretion. The determination of industry segments under the American Standard 'must depend to a considerable extent on the judgement of the management of the enterprise'. The significance criteria are only applied, in fact, after industry segments have been identified.

It seems, therefore, that any solution to the problem of identifying reportable segments involves the satisfaction of two major constraints if external user needs are to be met:

A. That the activities of the reportable segments as determined by the company's management exhibit homogeneity in regard to the effect of economic conditions upon results.

B. That the identified reportable segments are material in relation to the total company's results.

The proposal which follows seeks to satisfy both of these constraints by developing a method of identifying reportable segments which can be applied to any company situation.

A dual yardstick

The organisation of a company reflects a continuing process of adaptation to the uncertain business

¹⁹Financial Accounting Standards Board, *ibid.*, paragraphs 15-20.

²⁰Emmanuel, C. R. and Gray, S. J., 'Corporate Diversification and Segmental Disclosure Requirements in the USA', *Journal of Business Finance and Accounting*, Winter, 1977.

environment with respect to products, technology, and industry, and with respect to the location of its businesses and the markets they serve. Segmental disclosure must necessarily reflect the nature of the business if it is to inform users about different rates of growth, profitability and risk perceived by management as pertaining to its various activities. But if such disclosure is to be useful to external users in assessing a company's prospects and comparing it with other companies then some *external* yardstick for identification purposes would also seem necessary. Only then will there be a discipline on the disclosure made: something approaching an objective criterion which is verifiable. Without this the matter would be left entirely to the unfettered discretion of directors, notwithstanding the need to justify the disclosure by showing consistency with the organisation structure which is also under the directors' control. Moreover, an external yardstick could help to determine at what level of a company's organisation the disclosure cut-off point is material. Clearly, too much information would pose a burden on both those providing and those receiving it. Hence the organisation structure of the individual firm is suggested as an internal yardstick for the identification of segments to be used in conjunction with the Standard Industrial Classification (at the 3 digit level) as the external criterion for purposes of verification and interpretation.²¹ Segmental disclosures can then be more easily related to other relevant external data such as aggregate market, production and financial statistics for the sectors concerned. The potential for auditor authentication is also enhanced.

The application of these criteria is perhaps best illustrated by the means of some examples by which the feasibility of our proposal can be examined

subsequently. Consider, first, the organisation of Company X.

These segments of the organisation structure are consistent with the SIC at the 3 digit level. Therefore disclosure for each class of business could be required. This, however, ignores the manner in which the company is being managed. This structure is fairly frequently found in retail chains. If the activities of the transport and property segments are co-ordinated 'primarily' for the benefit of the retail outlet segment, then no segmental disclosure would be required. The problem now becomes one of defining 'primarily'. We would suggest a decision criterion to the effect that an organisational unit is a segment for reporting purposes if *all* of the following apply:

- (i) over 50 per cent of its physical sales volume is sold externally;
- (ii) revenue and profitability information is accumulated regularly for this unit;
- (iii) responsibility for the unit's operating performance resides with the immediate manager of the unit.

Effectively the conditions of a profit centre are applied to the organisational units of the company. Due to the size of the company, different organisational units must be recognised but this should not be taken as meaning that each is run as a separate business activity. The extent of the co-ordination of the activities may be roughly gauged by the degree of internal versus external trade. Let us now apply our proposal to an organisation structure such as that of Company Y.

At the first organisational level, the identified units are not consistent with the SIC at the 3 digit level. At the next tier, there is partial consistency. In respect to the Paper and Packaging Division, if less than 50 per cent of the sales volume of the paper and board department is sold internally and the units are treated as profit centres for internal purposes, then two reportable segments can be identified. For the engineering division, a further tier of the organisation structure must be uncovered. The electronics and telephone units are consistent with the SIC and if

²¹Note that our choice of the SIC as the appropriate external yardstick does not mean that it is necessarily superior to alternatives such as the FT - Actuaries Index. In fact, improvements to both of the systems would seem desirable but in the absence of an ideal classification it would seem to us that the SIC is more widely recognised and offers greater potential for future development.

Figure 1: Company X's Organisation Structure.

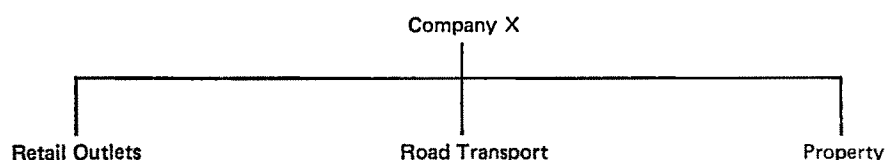
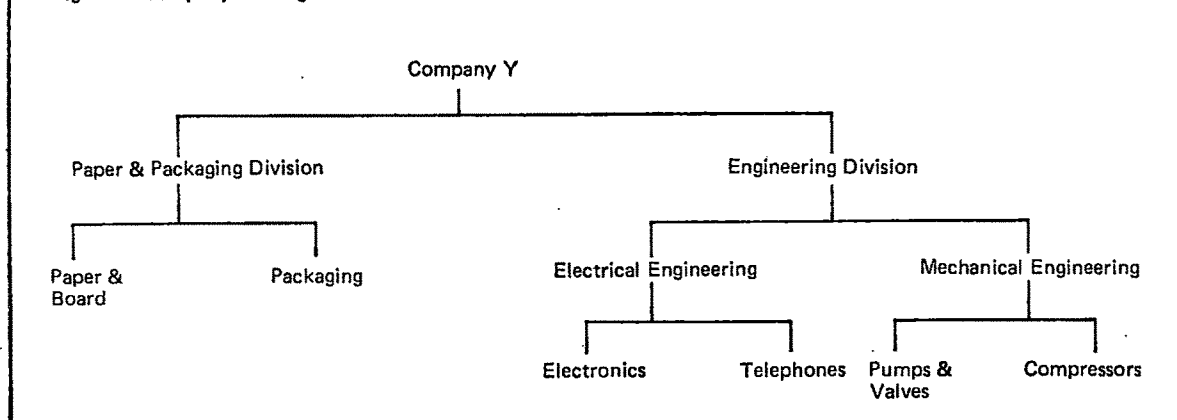


Figure 2: Company Y's Organisation Structure.



the three conditions for a profit centre are satisfied, two further reportable segments are discovered. On the mechanical engineering side, however, the company's organisation is inconsistent with the SIC, where pumps, valves and compressors constitute a single heading at the 3 digit level. The company now has a choice regarding the identification of reportable segments given that the sub-units conform with the definition of a profit centre. The company's executives can decide whether the gains from disclosing information for pumps, valves and compressors separately will outweigh any possible competitive disadvantages. Should separate disclosure not take place, the results of a reportable segment called Mechanical Engineering: pumps, valves and compressors will be given. For Company Y, given the assumptions about the individual unit's degree of dependence on internal trade, five segments can thus be identified and reported upon.

Before examining further the practical feasibility of the proposal, the conditions assumed to be sufficient for the identification of a profit centre must be inspected. The 50 per cent plus figure for external sales is arbitrary. Arguments about the materiality of the output as an input for other sub-units may arise. For instance, in the case of Company Y, the paper and board unit's internal sales may represent less than 50 per cent of that unit's physical sales volume but for the packaging unit these internal sales may represent more than 50 per cent of that unit's total demand for that input. But it is important to note that the internally traded commodity will be only one of perhaps several inputs that it needs. To have a symmetrical condition for the input or purchasing unit would ignore this fact and the focus of attention on external activities.

The rule therefore emphasises the output activity of the individual identifiable units. When the unit

produces more than one type of output, the 50 per cent rule applies to the average external sales to total physical sales. In situations where a physically diverse range of products is manufactured, the opinion of the auditors may decide whether disclosure is required or not. The relative *sales value* of the products may provide useful supplementary information in allowing the auditors to express an opinion.

With regard to the practical feasibility of the proposal, doubts must be expressed about the verifiability of the third condition that responsibility for the unit's performance resides with the immediate manager of the unit.

Along with our dual yardstick for identifying segments we would suggest, therefore, the desirability of a requirement for *all* companies to provide information about managerial responsibilities, organisation structure (preferably in the form of a chart showing both the business and geographical elements), and volume of internal transactions. This seems feasible judging by the best examples of current practice and would also facilitate auditor verification of the quality of segmental disclosures. Such additional information may also be significant in its own right as an indicator of company strategy.

The proposal therefore attempts to identify reportable segments by combining the management's method of operating a company's diverse activities with the SIC at the 3 digit level. The rigid use of the SIC to identify reportable segments is avoided by initially focusing on the company's organisation structure and hence a balance is struck between the use of managerial discretion and a potentially inflexible classification system. The reportable segments identified under the proposal are significant for external users because of the identification process. Successive tiers of the organisation structure are

uncovered only when disclosure is not consistent with the SIC. The process of disaggregation starts at the top and proceeds downwards which is in marked contrast with the FASB Statement which requires profit centres to be first identified, then industrial segments and finally reportable industrial segments. It is also unlikely that our proposed process of disaggregation will stop short of identifying segments which have a material effect on the enterprise's operating results. Furthermore, the absence of a quantitative significance criterion reduces the scope for manipulation inasmuch that modifications of the organisation structure will carry serious implications for internal control and behaviour. The proposal therefore appears to satisfy the twin constraints relating to the identification of realistic, material segments.

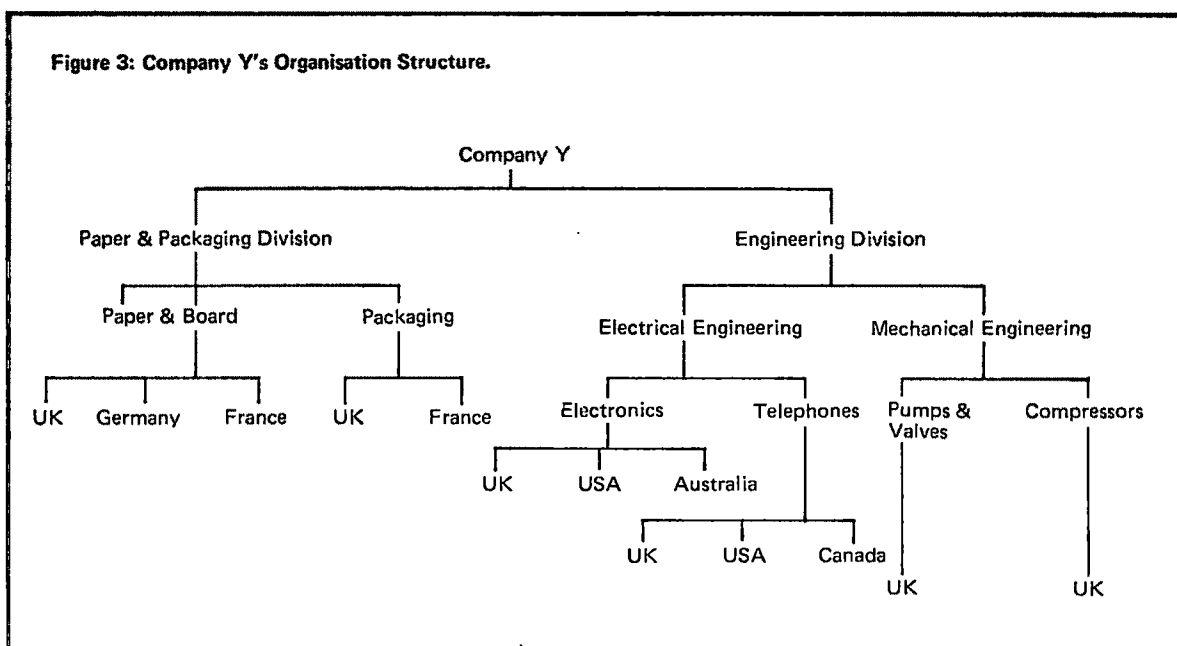
In addition to the discussion of business activity so far considered, an international analysis, both by location and markets, also requires consideration. What we suggest here is that again the primary yardstick to be used should be the organisation structure, identified in the same way as outlined earlier, but that disclosure should be made consistent with the geographical areas considered significant by management. In this respect a clear-cut disclosure by continent or country should be made depending on the organisation of the company concerned and the emphasis of its activities; though clearly there is a limit on the number of segments which could be identified without information overload. A mixing-up of geographical locations with the markets served from such locations should obviously be avoided.

We acknowledge that this approach to identifying

reportable geographical segments is not entirely satisfactory because of the discretion given to management. However, the use of significance criteria or other arbitrary rules is unlikely to be of universal application and could thus result in the provision of misleading information.

Considerations of integration on an international scale must also be accounted for so that if external sales, in terms of physical volume, for any international segment corresponding to a specific organisational unit are less than 50 per cent the separate disclosure of that segment may be omitted. A more complex situation arises when more than one organisational unit appears within an identified geographical segment. When the external sales of each unit are less than 50 per cent, only the total geographical segment need be disclosed. This indicates that our proposal in respect to business analyses can be applied primarily to the organisation structure if that structure initially identifies business activities, or it can be applied secondarily to the case where the organisation structure initially shows geographical locations. Hence an international analysis should also be disclosed irrespective of whether the organisation structure is business dominated as opposed to being geographically dominated or is some mixture/com-bination of both. A crucial distinction to be made concerns the disclosure of UK (or home country) performance from that overseas since this will assist the monitoring of national performance. In exceptional cases the 50 per cent rule would need to be relaxed in order that UK or home country performance could be distinguished from other geographical reportable segments.

Figure 3: Company Y's Organisation Structure.



An application of geographical disclosure relating to location can be illustrated with reference to the business-dominated organisation structure of Company Y.

It is first necessary to establish whether or not geographical segments exist relating to the business segments already identified from the organisation structure. If less than 50 per cent of the sales volume of the German or French locations of the Paper and Board department is sold internally and the units are treated as profit centres for internal purposes then three reportable geographical segments, including the UK, can be identified. A similar identification procedure can be adopted in the case of packaging, electronics, telephones and pumps, valves and compressors. If, say, in the case of telephones the Canadian unit was selling internally more than 50 per cent of its volume to the USA unit then a choice has to be made as to whether to aggregate Canada with the USA into a segment entitled North America or to disclose the Canadian unit separately with other similar units as 'non-segmented operations'. What is appropriate would seem to depend on the nature of the firm's other activities in the USA, and since there is a separate electronics operation it could be more informative to keep USA activities as a separate disclosure.

Clearly, the task of the auditor is an important one in this context, just as in the case of business analyses, for it rests on him to judge the meaningfulness of the segmental disclosures in the light of the company's international activities and its organisation of responsibilities to match such activities.

We have thus demonstrated the application of our

proposal with special reference to the identification of business segments. We have also considered the additional perspective of international operations. It should be emphasised, however, that the examples given serve only to illustrate our proposal. In practice, a complex variety of organisation structures will be found which will challenge both judgment and ingenuity to a greater degree than exhibited here. It is hoped, however, that our proposal will provide guidelines capable of meeting such a challenge.

Conclusion

The proposals made here in regard to business and international analyses would generally call for more information in order that segmental disclosure could be verified by auditors and their usefulness to external users enhanced. Information about organisation structure and some indication of the internal control system would be called for. However, the net result would be the disclosure of segment information which is meaningful and consistent with the way in which a company is operated. The proposal attempts to provide flexibility to facilitate the disclosure of comparable segment information but not at the expense of disguising the individual company's underlying philosophy and strategy. The materiality concept is therefore linked to managerial perceptions and not user perceptions, largely on the grounds that management are better placed to understand the nature of the business. A matching of the organisation structure and the SIC at the 3 digit level, or some other suitable classification, may help to identify segments in a way which is relevant, comparable and material for the purposes of investor decisions.

A Reinstatement of the Accounting Rate of Return

M. J. Mepham

The return on investment

The use of the 'rate of return on capital employed' as a tool for assessing an organisation's past performance and as a criterion for judging the acceptability of alternative operating plans, is well established. The rate of return is calculated as:

$$\frac{\text{period profit}^1}{\text{capital employed}}$$

but the result of this calculation will depend on the definitions used and, clearly, the consistent use of appropriate conventions is essential if comparisons are to be meaningful. A related measure which is frequently used for investment appraisal purposes is the 'accounting rate of return' (ARR)² despite the fact that it has been discredited by a succession of writers over the past two decades. The ARR is calculated by the same formula as the rate of return on capital employed but there is less room for variations in specifying the appropriate concept to use for the denominator.

In this article we will standardise on the term 'accounting rate of return' since there is no need to use two names for a single concept. It will be argued that a more rigorously (and more suitably) defined ARR has several positive attributes which should encourage a reappraisal of its usefulness for capital budgeting. It is also claimed that the proposed method of calculating the ARR should make it more useful as a measure of past performance in that it should facilitate comparisons with the investment appraisal calculations.

If the analysis of an investment opportunity indicates a given benefit as being achievable from its adoption then, if things proceed as planned, it seems appropriate that the reported statements of performance should confirm that the benefit has been received.

¹The profit calculation includes any interest received but it excludes any charge for interest paid.

²The most recent evidence of the continued popularity of this approach to investment appraisal is in the *Survey of Investment Attitudes and Financing of Medium-Sized Companies* (Research Report No 1, Committee to Review the Functioning of Financial Institutions, HMSO, 1978).

In practice it is true that plans will not be realised but it is important for control and motivational purposes that (as far as possible) any deviation of *ex post* reported values from *ex ante* planned values should be attributable to a divergence from the plan and not to any incompatibility between the investment appraisal procedures and the reporting conventions. It is difficult to ensure this compatibility. At present the methods which are most commonly used to report a firm's operating results are inconsistent with those appraisal techniques which are most frequently advocated as being necessary for sound investment decisions.

Example

We first distinguish, via an example, four *ex ante* measures of anticipated profitability: Net Present Value (NPV), Annual Value (AV), Internal Rate of Return (IRR) and Accounting Rate of Return (ARR), from the corresponding *ex post* measures of profitability. The article does not consider investment decision-making under uncertainty or the problems occasioned by changing price levels.

Assume that an opportunity exists to buy a lease on property which is producing £15,000 per annum in rent. The purchase price of the lease is £31,700 and it has only four years to run. If the cost of capital rate is 10% per annum, it can be shown that the project has a positive Net Present Value (NPV) of £15,848 and an Internal Rate of Return (IRR) of 31.49%. On the basis of either of these calculations the project could be commended as worthwhile. Another 'reputable' DCF measure is Annual Value (AV) which, for a project with a constant annual cash inflow of A for n years on an investment of P, is $A - P a_{n|k}^{-1}$, where k is the cost of capital rate. For the current proposal $AV = £5,000$ and, since this is positive, the project is acceptable.³ For projects with

³The AV method seems to be neglected in the literature of accounting and business finance but it is a popular method in engineering economics texts.

constant annual cash inflows following an initial investment outflow, the AV decision rule (accept if $A > P a_{n|k}^{-1}$) is clearly identical with the NPV rule (accept if $A a_{n|k} > P$). It can also be readily shown that the IRR decision rule (accept if $IRR > k$, will always give accept/reject advice which is in agreement with the NPV and AV rules.

If straight line depreciation is used the project's ARR is

$$\frac{(15,000 - 7,925)}{31,700} = 22.32\%$$

Although the ARR method of appraising a capital project has been extensively criticised, in the present case it gives the same advice as the other (more theoretically sound) methods since the ARR is above the cost of capital rate.

Assume that, on the basis of the foregoing calculations, the investment opportunity is accepted by a small group of friends who, for this purpose, form a property company with a paid up capital of £31,700. The company's shareholders wish to withdraw profits as dividends at the end of each year, whilst retaining in the company's bank account amounts

equal to the depreciation so that the company's capital is maintained intact. Interest is earned on deposits with the company's bankers at a rate of 10% per annum. To simplify the development we will assume that all receipts of rent and interest, all payments of dividend and all lodgements into the company's bank account are made at year ends and that the company's running expenses are so negligible that they can be ignored.

Interface with the profit measurement system

Assuming that the venture proceeds as planned, the calculations shown in Table 1 of assets owned, profit, Residual Income (RI)⁴ and ARR will be made if the straight line method is used to estimate depreciation.

⁴Residual Income is the period profit less a charge for the use of the invested funds: see R. N. Anthony, J. Dearden and R. H. Vancil, *Management Control Systems: Cases and Readings* (R. D. Irwin, 1965) - Case 3.2 'General Electric Company', pp. 90-98, and D. Solomons, *Divisional Performance: Measurement and Control* (R. D. Irwin, 1968).

TABLE 1

Year	Funds invested at the end of each year			Profitability calculations				
	Lease	Bank deposit	Total	Income from lease	Bank deposit interest	Total profit	RI	ARR
0	£31,700	—	£31,700	—	—	—	—	—
1	31,700	—	31,700	15,000	—	15,000		
	-7,925	+7,925	—	-7,925	—	-7,925		
	£23,775	£7,925	£31,700	£7,075	—	£7,075	£3,905	22.32%
2	23,775	7,925	31,700	15,000	792	15,792		
	-7,925	+7,925	—	-7,925	—	-7,925		
	£15,850	£15,850	£31,700	£7,075	£792	£7,867	£4,697	24.82%
3	15,850	15,850	31,700	15,000	1,585	16,585		
	-7,925	+7,925	—	-7,925	—	-7,925		
	£7,925	£23,775	£31,700	£7,075	£1,585	£8,660	£5,490	27.32%
4	7,925	23,775	31,700	15,000	2,378	17,378		
	-7,925	+7,925	—	-7,925	—	-7,925		
	£ —	£31,700	£31,700	£7,075	£2,378	£9,453	£6,283	29.82%

Consider the interface of the reporting system (which will report figures from Table 1) and three of the investment appraisal methods (NPV, AV and ARR).⁵ *NPV* The present value of the *ex post* residual income figures (when discounted at 10%) is the anticipated NPV of £15,848.

AV The *ex ante* AV can be obtained by taking a weighted average of the *ex post* residual income figures. The set of weights to be used has the property that the weight for year t is $(1 + k)$ times that for year $t + 1$. In the present case k is 0.1 and the weights are: 0.2868, 0.2607, 0.2370, 0.2155.⁶

ARR The net profit figures increase from year to year and when they are expressed as percentages of the invested capital, the resulting rates also increase. Although an ARR of 22.32% per annum was anticipated the rates of return shown by the accounts will range from 22.32% in year 1 to 29.82% in year 4. This peculiarity arises because the depreciation fund is earning interest at 10% per annum and this was disregarded in the *ex ante* ARR calculations.

⁵A comparison of the IRR with *ex post* rates of return is deferred until later.

⁶The weight for year t is $(1 + k)^{n-t} \cdot \frac{1}{n-k}$.

Sinking fund depreciation

A depreciation method which does recognise that retained depreciation funds normally earn interest is the sinking fund method. If this method is adopted the annual depreciation charge is £6,830, since this is the annual amount required to be set aside at the end of each year to provide £31,700 at the end of the fourth year. *Ex ante* calculations of NPV, AV and IRR remain unchanged but the ARR is now:

$$\frac{(15,000 - 6,830)}{31,700} = 25.77\%$$

Merrett and Sykes in their book *The Finance and Analysis of Capital Projects* (Longmans Green, 1974) use the name 'Sinking Fund Return' for this version of the ARR. Another writer who discusses the method is Hunt (*Financial Analysis in Capital Budgeting*, Harvard University, 1964).

If things proceed as planned the *ex post* calculations will be as in Table 2.

The bank deposit account is a sinking fund which is being accumulated to maintain the company's capital intact; the annual instalment to this, supplemented after the first year by the interest earned, is

TABLE 2

Year	Funds invested at the end of each year			Profitability calculations				
	Lease	Bank deposit	Total	Income from lease	Bank deposit interest	Total profit	RI or Ex post AV	ARR
0	£31,700	—	£31,700	—	—	—	—	—
1	31,700 -6,831	— +6,831	31,700 —	15,000 -6,831	— —	15,000 -6,831		
	£24,869	£6,831	£31,700	£8,169	—	£8,169	£4,999	25.77%
2	24,869 -7,514	6,831 +7,514	31,700 —	15,000 -6,831	683 -683	15,683 -7,514		
	£17,355	£14,345	£31,700	£8,169	—	£8,169	£4,999	25.77%
3	17,355 -8,264	14,345 +8,264	31,700 —	15,000 -6,830	1,434 -1,434	16,434 -8,264		
	£9,091	£22,609	£31,700	£8,170	—	£8,170	£5,000	25.77%
4	9,091 -9,091	22,609 +9,091	31,700 —	15,000 -6,830	2,261 -2,261	17,261 -9,091		
	—	£31,700	£31,700	£8,170	—	£8,170	£5,000	25.77%

the annual depreciation of the lease. The annual profit is now constant at £8,170 and the RI is £5,000 per annum.

NPV The project's *ex post* NPV can be obtained by multiplying its residual income by $a_{4|01}$ (i.e. 5,000 (3.1699) = £15,848). Although this calculation confirms the *ex ante* value it is more convenient for *ex post/ex ante* comparisons to concentrate on measures of annual benefit (such as AV and ARR) since *ex post* measurements are normally performed on an annual basis.

AV The AV is $A - Pa_{nlk}^{-1}$ but this can be re-written as $(A - Ps_{nlk}^{-1}) - Pk$ and this formulation is useful because $A - Ps_{nlk}^{-1}$ is the project's annual profit when the sinking fund depreciation method is adopted and Pk is interest on the investment required for the project. This means that:

AV = Annual Profit - Interest on the Funds Invested and this is *ex ante* residual income. The *ex post* residual income figures (£5,000 pa) thus confirm the AV calculation.

ARR The *ex post* ARR calculations of 25.77% now confirm the *ex ante* ARR calculation.

Ex post measurement of the IRR

The literature of investment appraisal normally emphasises a project's IRR rather than its ARR. There are two interpretations of the IRR. The IRR is either:

1. The maximum interest rate that can be paid for funds borrowed for the project if funds generated by the project can be re-invested at the same IRR (i.e. if the sinking fund investment earns interest at the project's IRR) or
2. The maximum interest rate that can be paid on outstanding funds invested in the project if the firm has the option to repay funds at will from the project's cash inflows.

We will distinguish the IRR interpreted as in (1) as IRR (1) and the IRR as interpreted in (2) as IRR (2). Both versions of the IRR are obtained by determining the interest rate which discounts the future incremental cash flows into equality with the project's initial cost. For the details being considered it is the value of r for which $31,700 = 15,000a_{4|r}$ and the IRR is therefore 31.49%.

Neither of the IRR assumptions agrees with the facts of our example so that *ex post* rate of return calculations cannot be expected to confirm the *ex ante* IRR. IRR (1) cannot apply since the funds generated by the lease are to be reinvested at 10% per annum not at the IRR. If the example's conditions are altered to enable the funds to be reinvested at the

IRR then the *ex post* calculations would confirm the *ex ante* values of the IRR, ARR and AV but then the ARR and the IRR would be identical.

IRR (2) does not apply since the shareholders' investment is not being repaid at will. If the terms of the illustration are altered to allow repayment (or if notional repayments are assumed) then Table 3 could be constructed.

Table 3 shows varying residual income figures none of which coincides with the *ex ante* AV of £5,000. It is however still true that the present value of these RI figures equals the *ex ante* NPV and the annual repayments of funds have been arranged so as to yield a constant *ex post* IRR of 31.49%. It should be noted, however, that the project is producing:

$$31.49\% \begin{cases} \text{on } £31,700 \text{ in year 1} \\ \text{on } £26,681 \text{ in year 2} \\ \text{on } £20,083 \text{ in year 3} \\ \text{on } £11,408 \text{ in year 4} \end{cases}$$

It is not yielding 31.49% on £31,700 for 4 years. The rate of return regarded from this viewpoint is incontrovertibly correct and it indeed conforms to a commonly used approach to its calculation which adopts the 'written down value' of the investment as the denominator. This denominator often seems inappropriate. For investment appraisal purposes it is clumsy since we cannot regard the resulting rate as being earned on the full amount invested in a project for the life of the project.⁷ If used in assessing profitability, *ex post*, the method is widely recognised as being faulty since an investment which has been largely amortised can show a very high rate of return with a profit which is very small in absolute terms. Since advocates of the IRR often insist that there is no assumption that funds generated by a project can be reinvested at the IRR, they are necessarily adopting the IRR (2) interpretation.

IRR and ARR - a comparison

In the preceding sections two versions of the rate of return have been discussed, the ARR and the IRR. It has been emphasised that, of the two interpretations of the IRR, only IRR (1) can be regarded as a rate of return on the funds committed to a project for the life of the project. The ARR and IRR (1) will now be compared.

$$\begin{aligned} \text{The ARR} &= \frac{A - Ps_{nlk}^{-1}}{P} \text{ whereas the IRR} = r \\ &= \frac{A - Ps_{nlr}^{-1}}{P} \end{aligned} \quad \text{Both methods can be regarded as}$$

⁷See the later discussion of the ranking of projects.

⁸When $k = 0$ or $n = 1$ or $1 \leq n < \infty$ this gives the ARR using straight line depreciation.

TABLE 3

Year	Funds invested at the end of each year	Repayments of funds at year ends	Profit calculations	RI	Ex post IRR (Profit as a percentage of investment)
0	£31,700	—	—	—	—
1	£26,681	£5,019	15,000 -5,019 <hr/> £9,981	£6,811	31.49%
2	£20,083	£6,598	15,000 -6,598 <hr/> £8,401	£5,733	31.49%
3	£11,408	£8,675	15,000 -8,675 <hr/> £6,325	£4,317	31.49%
4	—	£11,408	15,000 -11,408 <hr/> £3,592	£2,451	31.49%

relating annual profit (i.e. annual cash inflow less a depreciation charge) to the funds invested. Both methods involve the use of the sinking fund depreciation method so that an important question is 'what rate of interest can be earned by the sinking fund?' In ARR calculations we assume that the sinking fund rate is the cost of capital rate (k).⁹ In contrast, IRR (r) calculations assume that the reinvestment rate is the IRR itself and thus it varies according to the project under consideration – this is hardly realistic and in cases where a project's IRR is high the sinking fund rate will be optimistically high.

It will be noted that as n gets larger

$s_{nr}^{-1} = \frac{r}{(1+r)^n - 1}$ becomes smaller for both $r = k$ and $r = \text{IRR}$, and if n tends to infinity then, at the limit, both the IRR and the ARR equal $\frac{A}{P}$

Figure 1 shows this for $P = £31,700$, $A = £15,000$ and $k = 0.10$.

⁹It is possible to use some other reinvestment assumption if this is considered more appropriate but such a change may affect the identity in accept/reject advice that exists for the NPV, AV, ARR and IRR.

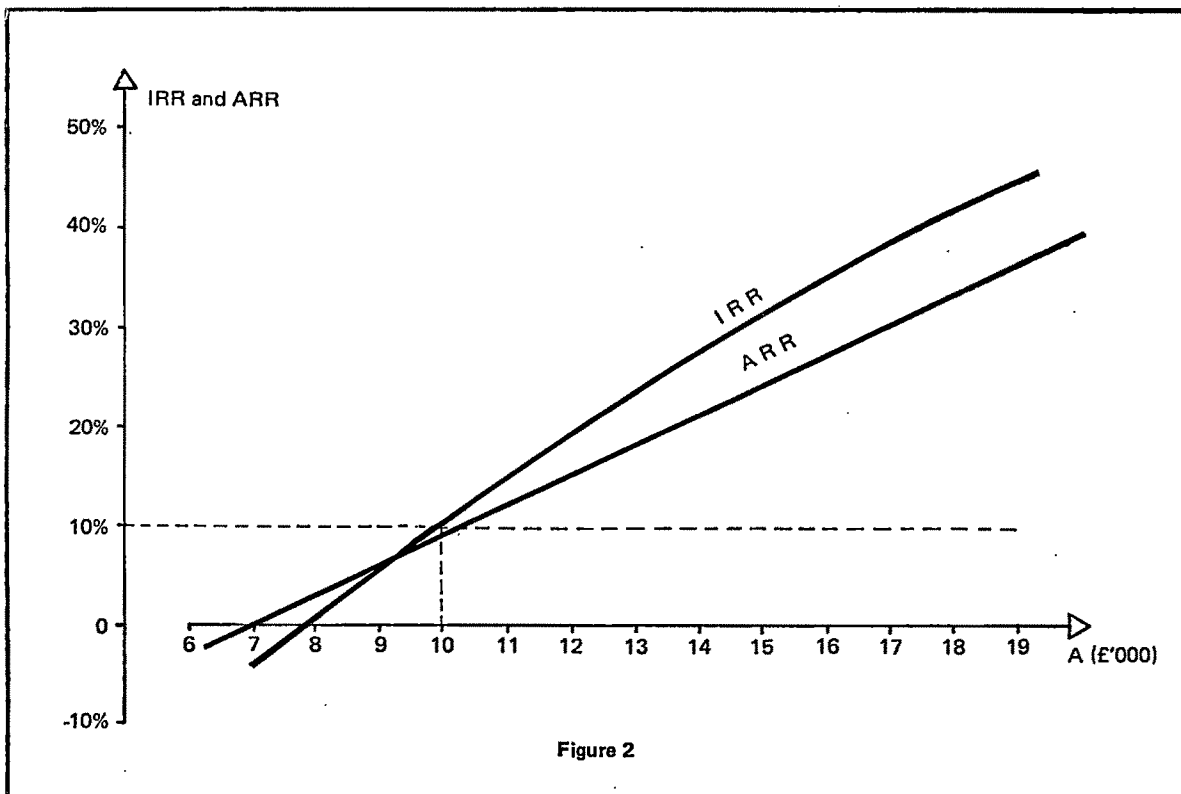
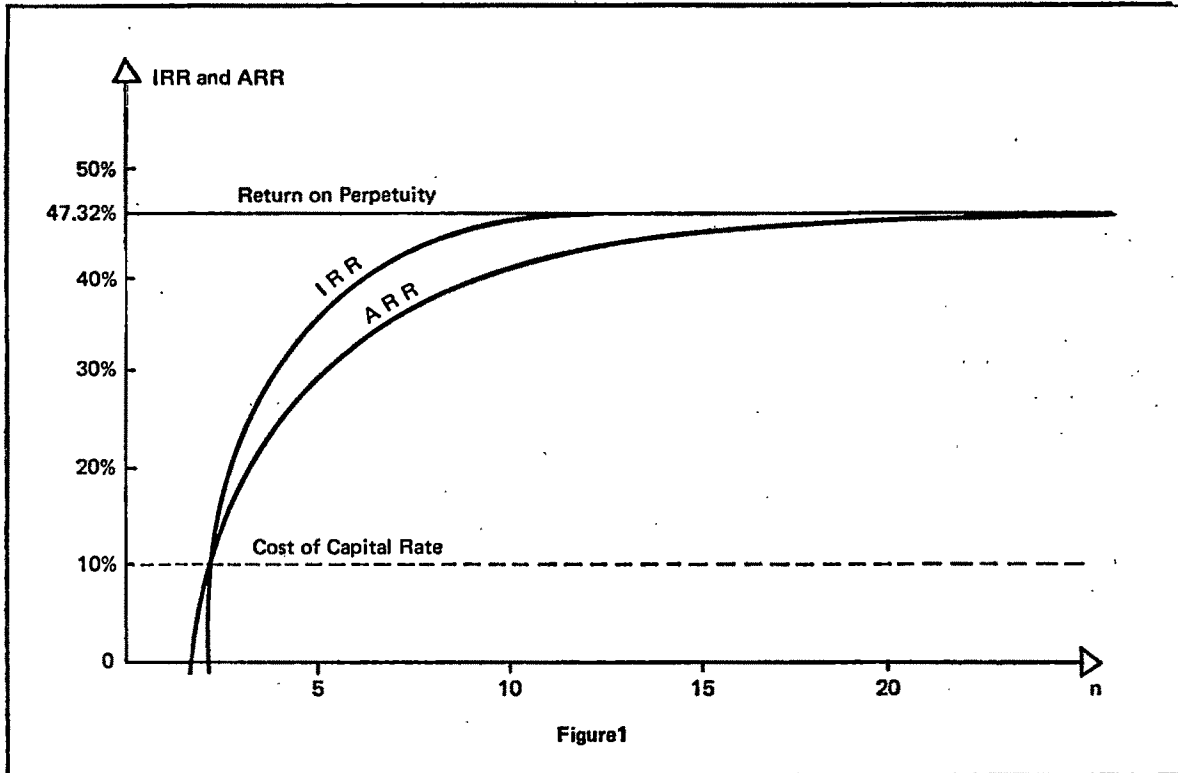
Figure 2 shows the behaviour of the IRR and the ARR for $P = £31,700$, $k = 0.10$ and $n = 4$ as A changes. Note that the ARR is a linear function of A .

These diagrams could be useful as a form of sensitivity analysis but our immediate objective is to use them to show that, for projects with constant annual cash inflows, if the ARR, with the reinvestment rate set at k , is above k then the IRR is also higher than k , and also that if $\text{ARR} < k$ then $\text{IRR} < k$. For a marginal investment $k = \text{IRR} = \text{ARR}$. The two methods thus give consistent advice if the problem under consideration is whether or not to accept a given proposal.

Uneven cash flows

We now remove the assumption that a project has constant net cash inflows for each year of its life. Consider a proposal to purchase a 4 year lease which has an initial cost of £31,700 and which will yield an increasing rental of:

£4,500 at the end of the first year,
£9,000 at the end of the second year,
£18,000 at the end of the third year,
and £36,000 at the end of the fourth year.



The cost of capital rate is assumed to be 10% per annum.

The NPV is obtained by deducting the initial outflow of cash from the present value of the anticipated cash inflows, $NPV = £49,641 - £31,700 = £17,941$. The project is acceptable since it has a positive NPV.

The AV of the project can be obtained by converting the uneven cash flow to an equivalent smoothed flow of a constant annual amount, A. The procedure for obtaining A is best thought of as one of forming a weighted average of the cash inflows. Using the same weighting scheme as previously

$A = 0.2868 (£4,500) + 0.2607 (£9,000) + 0.2370 (£18,000) + 0.2155 (£36,000) = £15,660$. From A we deduct the 4 year annuity which could be obtained from an outlay of £31,700 so that $AV = £15,660 - £10,000 = £5,660$.

An alternative way of obtaining the AV is to convert the NPV into an equivalent annuity by multiplying by $a_{40.1}^{-1} = 0.3155$ i.e. $£17,941 (0.3155) = £5,660$. From this viewpoint it is clear that AV is positive if and only if NPV is positive since a_{nk}^{-1} is always greater than zero.

The ARR calculation requires the average annual profit. This is the average annual cash inflow (£15,660) less the annual sinking fund appropriation which is $P_{s_{nk}}^{-1} = £31,700 (s_{40.10}^{-1}) = £6,830$. Using the average profit we calculate the ARR as

$$\frac{8,830}{31,700} = 27.85\%$$

Note that the average annual profit (the numerator in this fraction) is the project's AV (i.e. £5,660) plus interest on the investment (i.e. 10% of £31,700). It follows that if the AV is positive, the ARR must be higher than k since the interest charge alone in the numerator would give $ARR = k$. Conversely if $AV < 0$ then $ARR < k$ and if $AV = 0$ then $ARR = k$.

The IRR is 27.06% and, since this rate is above k , the project is deemed acceptable. If a project's NPV is positive $\Sigma A^{(t)}v_{tk} > P$, where $A^{(t)}$ is the cash inflow at the end of year t . If another rate of interest, r , gives $\Sigma A^{(t)}v_{tr} = P$ then (assuming that no $A^{(t)}$ is negative) $v_{tr} < v_{tk}$ and this means $r > k$. We are thus assured that if NPV is positive $IRR > k$ and we can similarly show that if $NPV < 0$ then $k > IRR$ and that if $NPV = 0$ then $k = IRR$.

Variable cash inflows and ex post profit measurement

When cash inflows are expected to vary from year to year, problems arise because there is a conflict between the underlying assumptions used in the investment appraisal procedures and profit measure-

ment conventions. The AV and ARR are average values for an average year whereas the established profit measurement procedure is to match the realised revenue of each year with an estimate of the cost incurred in earning that revenue. The resulting residual income and *ex post* ARR values are not calculated from average cash flow figures and the most that can be hoped for is that the *ex ante* measures should be averages of the *ex post* values.

Consider the pattern of annual profits which will emerge for the project used as an illustration in the last section. It will be assumed that things turn out as planned. Since the cash inflows are anticipated to be uneven it is appropriate (following the 'matching principle') to relate depreciation to the planned receipts pattern. Let d be the sinking fund contribution for £1 of revenue, then:

$$£4,500 (1.10^3)d + £9,000 (1.10^2)d + £18,000 (1.10^1)d + £36,000 (1.10^0)d = £31,700 \text{ and } d = £0.4362.$$

If everything proceeds as planned, the *ex post* calculations will be as shown in Table 4. In no year does the *ex post* ARR equal the *ex ante* ARR of 27.85%. It can be shown, however, that, using the same weights as previously, the weighted average of the *ex post* ARRs does equal 27.85% i.e. $8.00 (0.2868) + 16.01 (0.2607) + 32.02 (0.2370) + 64.03 (0.2155) = 27.85\%$. Similarly it can be shown that a weighted average of the residual income figures equals the *ex ante* AV, i.e. $-633 (0.2868) + 1,905 (0.2607) + 6,979 (0.2370) + 17,127 (0.2155) = £5,660$, and also the present value of the residual incomes (discounted at k) is the *ex ante* NPV. It must be emphasised that the above results for the AV and NPV hold for any depreciation method not merely for the method that has been used in this section.

Mutually exclusive projects

The analysis to this point has assumed the existence of a review set made up from independent projects. This assumption will now be removed and, in the first instance, the situation which arises when two projects are mutually exclusive will be considered.

In cases where $P_1 = P_2$, $n_1 = n_2$ and both projects promise constant annual cash inflows, all the methods under consideration give consistent advice. If $A_1 > A_2$ then $IRR_1 > IRR_2$, $ARR_1 > ARR_2$, $AV_1 > AV_2$ and $NPV_1 > NPV_2$ and project 1 is unequivocally shown to be better than project 2. More difficult problems arise when the prospective cash inflows of one (or both) projects are not constant.

Assume that the company which we have earlier been using as an example has been given the choice of two alternative rental agreements for the lease

TABLE 4

Year	Funds Invested at the end of each year			Profitability calculations				
	Lease	Bank deposit	Total	Income from lease	Bank deposit interest	Total profit	RI	ARR
0	£31,700	—	£31,700	—	—	—	—	—
1	31,700 -1,963	— +1,963	31,700 —	4,500 -1,963	— —	4,500 -1,963		
	£29,737	£1,963	£31,700	£2,537	—	£2,537	-£633	8.00%
2	29,737 -4,121	1,963 +4,121	31,700 —	9,000 -3,925	196 -196	9,196 -4,121		
	£25,616	£6,084	£31,700	£5,075	—	£5,075	£1,905	16.01%
3	25,616 -8,459	6,084 +8,459	31,700 —	18,000 -7,851	608 -608	18,608 -8,459		
	£17,157	£14,543	£31,700	£10,149	—	£10,149	£6,979	32.02%
4	17,157 -17,157	14,543 +17,157	31,700 —	36,000 -15,703	1,454 -1,454	37,454 -17,157		
	£ —	£31,700	£31,700	£20,297	—	£20,297	£17,127	64.03%

which it has decided to acquire for £31,700. Alternative 1 would yield a constant rent of £15,000 per annum for four years. Alternative 2 would give an increasing rental, £4,500 at the end of the first year, £9,000 at the end of year 2, £18,000 at the end of year 3 and £36,000 at the end of year 4. We have already made the following computations for these two projects:

	Project 1	Project 2
IRR	31.49%	27.06%
ARR	25.77%	27.85%
AV	£5,000	£5,660
NPV	£15,848	£17,941

A comparison of the IRRs would suggest that project 1 should be accepted in preference to project 2 but the other three measures seem to indicate that project 2 is better than project 1.

The conflict arises because the IRR is inappropriate for any problem which involves the ranking of projects or a choice between projects. To substantiate this statement we first consider IRR (1). This interpretation of the IRR claims that for alternative 1 the rate of return is 31.49% providing that cash generated can be reinvested at that rate whereas alternative 2

yields 27.06% providing that cash can be reinvested at 27.06%. With such inconsistent assumptions as to reinvestment rates IRR (1) cannot logically be supported for making a choice between mutually exclusive projects which are expected to continue for more than a year; more generally it cannot be used to rank projects in order of their attractiveness.

Consider now IRR (2). The rates are now interpreted as having the following meaning:

Alternative 1 earns

31.49% on £31,700 in year 1,
on £26,681 in year 2,
on £20,083 in year 3,
and on £11,408 in year 4.

Alternative 2 earns

27.06% on £31,700 in year 1,
on £35,778 in year 2,
on £36,460 in year 3,
and on £28,326 in year 4. } (Additional funds borrowed at a cost of 27.06% pa interest).

It is difficult to see how this information could be used to judge between the alternatives.

Reinvestment assumptions

Unfortunately, even when the IRR is removed from consideration as being unsuitable for ranking purposes when mutually exclusive projects are under consideration, conflicts are still possible among the remaining three measures. The conflicts are not as to whether a project is acceptable or not but as to which of two (or more) acceptable projects is the best. To deal with these conflicts it is essential to be clear as to the exact nature of the investment problem and the precise emphasis and underlying assumptions of each measure.

ARR is a *value per year per pound invested*

AV is a *value per year*

NPV is a *value*

When comparing the differences in emphasis the following presentation of the mathematical connections among the measures is useful:

$$\underbrace{\left[\frac{A}{P} - s_{n|k}^{-1} - k \right]}_{\text{ARR}} (P) \quad (a_{n|k})$$

$\underbrace{\hspace{10em}}_{\text{AV}}$
 $\underbrace{\hspace{15em}}_{\text{NPV}}$

Note that although A is included as a term in the formulae, this may be a weighted average of the anticipated cash flows if these are not constant.

A study of the formulae will show that if (for projects 1 and 2) $ARR_1 = ARR_2$ then it is possible that $AV_1 \neq AV_2$ and $NPV_1 \neq NPV_2$. These inequalities will arise if $P_1 \neq P_2$. Further with $ARR_1 = ARR_2$, and $AV_1 = AV_2$ it is possible that $NPV_1 \neq NPV_2$ and this will occur if $n_1 \neq n_2$ for then $a_{n_1|k} \neq a_{n_2|k}$. All three measures take into account the same basic information but the underlying assumptions vary in important respects. We first consider cases where the investment required for mutually exclusive projects is the same for all alternatives but the annual cash inflows and the lives of the projects are dissimilar. In such cases NPV can choose a project which differs from that selected by the ARR and AV approaches. The conflict arises because the NPV method implicitly assumes that if the funds are invested in a project with a short life they can only be reinvested at the cost of capital rate when they are released on the termination of that project. These funds therefore add nothing to the NPV for their use in the time period which extends from the date the project is anticipated as ending and the date when the alternative with the longest life expectancy ends. The AV and ARR methods, however, can be interpreted as assuming that each project is replaced at the end of its life by a similar project earning a similar ARR

(which is presumably higher than the cost of capital rate).

Although we have defined the AV as the annual value of an investment *during its life* and the ARR (and IRR (r)) as annual rates of return earned on funds employed *for the life* of the project, all three measures can be validly reinterpreted as applying *in perpetuity* if a project can be supposed to be repeated every n years indefinitely into the future. For us to blandly assume an infinite number of cycles with a project being reincarnated at the end of its life as a similar project for a future existence, may seem to be unrealistic but, in the absence of a better forecast of the likely course of future events, it may be the most sensible assumption to make. Professor Baxter has written in this context: 'As long as one cannot tell to which side a wobbly cyclist is likely to swerve, one had better assume that he will come straight on . . .' (W. T. Baxter, *Depreciation*, Sweet and Maxwell, 1971, p. 9).

Other things being equal, a project with a longer life is more favourably regarded than one with a shorter life by all three ranking methods that we are considering but the NPV ranking gives longer lived projects an additional bonus by making an unfavourable assumption concerning the earnings obtainable from funds released by shorter lived projects when these terminate.

The fundamental cause of the conflict being discussed is our frequent inability, in the real world of uncertainty, to follow the complete logic of the certainty assumption. If we did have complete knowledge of all the cash flows which would follow from the adoption of each alternative course of action then this data could be analysed to a convenient terminal date and the same time horizon would be adopted for each alternative.¹⁰ No reinvestment assumptions would be necessary and the NPV, AV and ARR could not conflict (at least for this reason). In practice the analyst may have cash flow data for one project which applies to a time period which differs from that available for a rival project. In such circumstances, if reinvestment assumptions are not made explicitly, the method of analysis used will introduce assumptions implicitly.

It should be noted that, where the NPV ranking differs from that provided by the AV and ARR methods, it gives preference to projects with longer pay back (PB) periods.

Consider the following two mutually exclusive projects:

¹⁰The problem of assessing the value of each alternative at this horizon date would remain and there would often be formidable combinatorial difficulties.

Project 1 $P_1 = £31,700$, $A_1 = £15,000$, $n_1 = 4$ years and

Project 2 $P_2 = £31,700$, $A_2 = £10,000$, $n_2 = 7$ years; $k = 0.10$ for both projects.

The following can be calculated:

Project 1 $ARR_1 = 25.77\%$, $AV_1 = £5,000$, PB Period 2.1 years, $NPV_1 = £15,848$.

Project 2 $ARR_2 = 21.01\%$, $AV_2 = £3,489$, PB Period 3.2 years, $NPV_2 = £16,984$.

Although the PB criterion is not a sound method of ranking, it is often used as a supplementary technique particularly when liquidity is an important consideration.

The foregoing may be regarded as favouring the AV and ARR for choosing among mutually exclusive investment opportunities when there is a conflict with the NPV solution, but the ARR and AV may also conflict. This can arise when the required investment is not common for all alternatives. When ample funds are available at a given cost of capital rate then it is logical to favour projects which have the highest absolute value. The AV ranking is then to be preferred. The situation which arises when projects are competing for scarce funds is considered in the next section.

Capital rationing

We have been assuming that there is an unlimited availability of funds for investment at a fixed cost of capital rate but it is normally agreed that (at least beyond a certain level of investment) the cost of capital rate will increase as more funds are required. The decision rule provided by established theory is that the firm should continue to invest until the rate of return obtained from the marginal £ invested equals the cost of obtaining that £. We have modified this rule by adopting a fixed rate but this will usually be an acceptable simplification providing that the rate adopted is approximately that obtaining at the

firm's optimal level of investment. If, however, the firm erroneously uses a test rate which is too low, this could lead to bad investment decisions, e.g. the firm could overshoot the optimal level of investment. This danger is augmented (even when the firm has a limited certainty about the outcomes of projects that are being considered) by uncertainty as to future investment opportunities since the firm might wish to restrain its current investment activities if it believes that potentially more attractive projects may arise in the future.

The realisation that such problems exist may lead the firm to establish a limit to the funds which it is willing to regard as available for investment during the forthcoming period and with such capital rationing it is necessary to rank projects if the funds required for acceptable projects exceed the funds available for investment. ARR is particularly appropriate for this task of ranking. As the ARR is an annual value per £ of funds invested and the fund available for investment is the limiting factor, the ARR can be interpreted as indicating the annual value per unit of limiting factor. Furthermore, since $\frac{AV}{P} = ARR - k$, it follows that if we assume an objective of maximising the total AV of accepted projects (when all projects in the review set are independent) this can be achieved by ranking projects via their ARR's and then progressing down this list accepting all projects until either a project is reached which has an ARR below k or else the next £ to be invested would push the total invested beyond the fund limit.

Figure 3 illustrates this procedure. In this diagram L is the investment limit and each 'block' relates to a project under consideration; these projects have been ranked and numbered via their ARR's. Projects 1, 2, 3, 4 and 5 should be accepted and this programme clearly maximises the AV of the accepted projects.

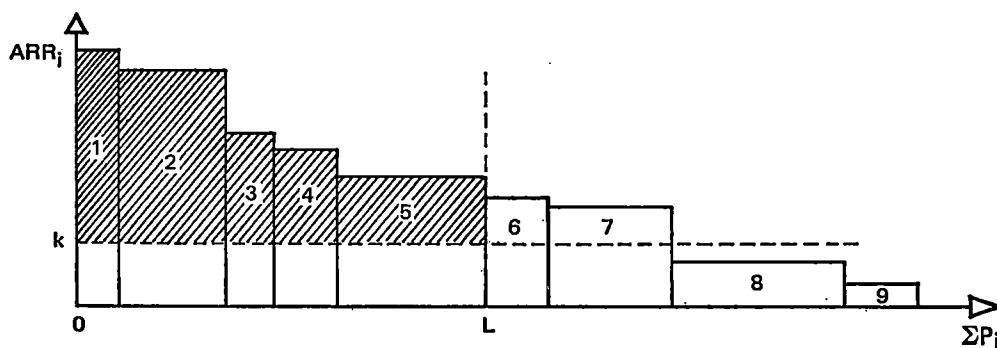


Figure 3

This AV is given by the area of the shaded part of the diagram; this area is

$$\sum_{i=1}^5 (ARR_i - k)P_i.$$

If the funds limitation constraint operates, it is probable that the optimal investment schedule will require a fraction of the marginal project to be accepted. If this is not possible and the funds cannot be extended to take in all the marginal project, then, strictly, all possible collections of projects yielding more than the cost of capital rate would have to be examined to see if there is a better plan. The difficulty of this procedure depends on the length of the list of projects.

A similarly cumbersome approach is required when there are mutually exclusive projects in the review set – then we are required to consider each feasible subset of acceptable projects and this again can be difficult if the number of projects is not small. Programming methods of performing this search in a more satisfactory manner exist¹¹ and these would also be useful if the investment plan for several time periods is required.

The sinking fund

The existence of an externally invested sinking fund for each project has been assumed in the foregoing but the maintenance of such investments would be unusual and of doubtful economic sense since usually the funds could more profitably be put to use within the firm. The reinvestment of funds within the firm reduces (or removes) the need to borrow at the cost of capital rate and this is a justification for using this rate as the sinking fund rate. The absence of externally invested sinking funds does not affect the validity of the *ex ante* ARR and AV calculations as a basis for judging prospective projects but it does necessitate some modifications to *ex post* profit measurement calculations. These adjustments will now be considered together with the application of the method to a multi-asset firm.

Assume that four projects have been implemented by a firm with a cost of capital rate of 10%. Each project required an investment of £1,000 and each has an expected life of four years.

Project 1 has annual cash inflows of £500 p.a.,
Project 2 has annual cash inflows of £450 p.a.,
Project 3 has annual cash inflows of £400 p.a. and
Project 4 has annual cash inflows of £350 p.a.

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At the end of the current year, Project 1 is one year old, Project 2 is two years old, Project 3 is three years old and Project 4 is four years old. The firm is in 'equilibrium', neither expanding nor contracting its investment but renewing each project every four years. No externally invested sinking funds are maintained as retained funds are more profitably used in replacing the current four year old project. The reinvestment of funds internally can still be regarded as investment in a sinking fund but there is a danger of double counting since a part of the cash inflow yielded by each project can also be related to the sinking funds of other projects which helped to finance it. This does not cause difficulty when profits, AVs and ARRs are calculated (*ex ante* or *ex post*) for individual projects but an adjustment is required (to prevent double counting) when project profits are consolidated to give the firm's profit.

The *ex ante* investment appraisal calculations for the projects would have been:

	Project 1	Project 2	Project 3	Project 4
NPV	£585	£426	£268	£109
AV	£184.5	£134.5	£84.5	£34.5
ARR	28.45%	23.45%	18.45%	13.45%

The *ex post* profitability calculations are given in Table 5.

The *ex ante* AV and ARR values for the individual projects are confirmed by these calculations but consolidation adjustments are necessary in combining the project figures. The adjustments relate to the notional sinking fund. The fund itself has to be removed from the firm's investment base and interest on the fund has to be deducted (as additional depreciation) from the consolidated profits. The same amount of interest is added back in calculating the firm's residual income.

Summary

In this final section the main pros and cons of the ARR will be summarised under three heads: its relevance for investment appraisal, its use for assessing past profitability and the interface between the *ex ante* estimates and *ex post* measurements.

Discounted cash flow methods are generally agreed to be relevant for investment decisions but there are various types of investment problem and a particular version of DCF may be more appropriate for one of these than it is for another. For problems requiring a straightforward accept/reject decision¹²

¹¹See H. M. Weingartner, *Mathematical Programming and the Analysis of Capital Budgeting Problems*, (Kershaw Publishing Co. Ltd., 1974).

¹²That is, problems where the decision maker is considering a set of independent projects and there are ample funds available at a given cost of capital rate.

TABLE 5

	Project 1	Project 2	Project 3	Project 4	Consolidation adjustment	Total
Investment	<u>£1,000</u>	<u>£1,000</u>	<u>£1,000</u>	<u>£1,000</u>	<u>-£1,380</u>	<u>£2,620</u>
Cash inflow	500.0	450.0	400.0	350.0	—	1,700
Depreciation	<u>-215.5</u>	<u>-215.5</u>	<u>-215.5</u>	<u>-215.5</u>	<u>-138</u>	<u>-1,000</u>
Profit	<u>£284.5</u>	<u>£234.5</u>	<u>£184.5</u>	<u>£134.5</u>	<u>-£138</u>	<u>£700</u>
Interest on investment @ 10%	-£100.0	-£100.0	-£100.0	-£100.0	+£138	-£262
RI	<u>£184.5</u>	<u>£134.5</u>	<u>£84.5</u>	<u>£34.5</u>	<u>—</u>	<u>£438</u>
ARR	<u>28.45%</u>	<u>23.45%</u>	<u>18.45%</u>	<u>13.45%</u>	<u>-10%</u>	<u>26.72%</u>

NPV is particularly appropriate (although AV, ARR and IRR will give the same advice as NPV). For problems where a choice has to be made between mutually exclusive alternatives there is a need to make comparisons over a common review period and an AV is relevant as an annual review period is conventionally acceptable. Where capital rationing requires the ranking of projects an ARR is useful as it gives the (annual) profitability per £ of investment required. It must be stressed that the particular versions of the AV and ARR that have been considered in this paper make specific reinvestment assumptions and if it is considered that these are inappropriate in any given case alternative rates should be substituted.

In the area of profitability measurement the relationship of profit to capital employed can be recognised by charging interest on the funds invested to calculate residual income and/or by expressing the profit as a percentage of these funds. Numerous versions of both approaches have received considerable attention from accountants. The main problem of the particular definition of the ARR that we have proposed is its employment of the sinking fund depreciation method. This method is seldom used but it is conceptually sound and we have emphasised that there is no need to maintain an external sinking fund investment. If no external fund is kept the summation of project or investment centre profits and capital employed overstates enterprise profit and investment. A straightforward consolidation adjustment is required to rectify this and if RI is calculated

(as Anthony and Solomons propose¹³) the enterprise RI is the sum of the individual RI figures.

Where the manager of an investment centre is expected to make investment decisions using a DCF approach while his short term performance is being judged by reference to his division's profit calculated on a basis which is inconsistent with this approach then, as Bromwich says, 'given such a divergence, divisional management when selecting investment projects may opt for those giving good short-run performance at the expense of long-term profitability' ('Measurement of Divisional Performance - A Comment and Extension', *Accounting and Business Research*, Spring 1973, p. 123). Flower ('Measurement of Divisional Performance', *Accounting and Business Research*, Summer 1971, pp. 205-214) identifies profit measurement procedures which are consistent with the DCF methods of appraisal and he supports the suggestion that interest should be charged on the book value of an investment centre's assets and residual income calculated so that divisional managers cannot ignore the cost of financing the equipment that they are using. Flower also discusses cases where it is possible to calculate asset values and depreciation charging patterns which will ensure that, if things proceed as planned, a project's *ex post* ARR will equal its predetermined IRR. He doubts however whether the depreciation methods which he outlines would be acceptable in practice.

¹³See footnote 4.

In this article a different approach has been proposed. No attempt has been made to reconcile an *ex post* ARR with the *ex ante* IRR;¹⁴ rather it has been shown that the IRR can be replaced by a suitably defined ARR (and AV) or a weighted average of the yearly ARRs (and AVs) where a project's cash flow is not anticipated to be constant from year to year. This measure has utility for both investment appraisal purposes and for measuring operating performance and profitability. This is important since, although some would claim that the measurement of profitability and the control of investment decisions cannot be achieved via a single measure such as ARR (or RI),¹⁵ nevertheless there is a strong tradition of using

rates of return in this way and the measure has survived and flourished in the face of considerable criticism. Whilst it is not claimed that the ARR described in this article solves all the difficulties, it is thought that the suggested approach has significant advantages over other methods that have been suggested.

¹⁴In this connection see G. C. Harcourt, 'The Accountant in a Golden Age', *Oxford Economic Papers*, March 1965, pp. 66-80; E. Solomon, 'Return on Investment: The Relation of Book Yield to True Yield', *Research in Accounting Measurement*, American Accounting Association, 1966, pp. 232-244; J. Livingstone and G. Salamon, 'Relationship Between the Accounting and the Internal Rate of Return Measures: A Synthesis and an Analysis', *Journal of Accounting Research*, Autumn 1970, pp. 199-216; L. A. Gordon, 'Accounting Rate of Return vs Economic Rate of Return', *Journal of Business Finance and Accounting*, Autumn 1974, pp. 343-356. J. A. Kay, 'Accountants, too, Could be Happy in a Golden Age: The Accountants' Rate of Profit and the Internal Rate of Return', *Oxford Economic Papers*, November 1976, pp. 447-460.

¹⁵e.g. J. Dearden, *Cost Accounting and Financial Control Systems*, Addison-Wesley Publishing Co., 1973, pp. 427-430.

Walter Taplin Prize

The Association of University Teachers of Accounting, the Council of Departments of Accounting Studies and *Accounting and Business Research* offer a prize of £75 for the best article published in each annual volume. The prize is named in honour of the journal's founding editor, Walter Taplin.

The winning article is chosen by the subscribers. Their choice in 1976/77 was Edward Stamp, *ED 18 and Current Cost Accounting: A Review Article* (Spring 1977).

Communication in the Corporate Budgetary System

Lee D. Parker

In much of the accounting literature, the corporate budgetary system is studied as a control device whereas accountants have recognised it as being a device also for planning, decision-making and communicating. This paper sets out to investigate how budget-related communications may be improved so as to facilitate the system's effective operation and to stimulate its use by corporate personnel as an efficient communication channel. Central to the accountants' contribution here is the improvement of their understanding of the nature of communication processes and their potentialities and limitations. This theoretical understanding by itself, however, is not sufficient and some more pragmatic approaches are therefore also considered. Though professing to occupy a central position in the corporate information system, accountants have neglected to pay adequate attention to the necessary skills for becoming effective communicators and here lies the rationale for the treatment of budget-related communication in this paper. With a better understanding of communications mechanisms and networks, accountants will be able to consider means of improving their reports to line personnel, of improving the exchange of information in budget planning and review meetings and of stimulating a greater flow of information about actual operations up from the shop floor.

With a view to re-emphasising the vital communicating role of the corporate budgetary system, this paper will first examine fundamental aspects of the communication process. By means of a discussion of the inherent nature of communication, the factors influencing its effectiveness and its various structures within organisations, inferences are drawn for accounting practice within the budgeting process. The paper will then move on to consider the role of the accountant himself in the corporate communication network since his actual and perceived role is a critical factor in any efforts to improve budgetary communication. From this point, possible

methods for improving both upward and downward directed budget communication will be investigated. By means of these discussions the paper therefore sets out to establish what might be termed a reciprocal relationship between organisational communication and the corporate budget in that the budget has the potential to act as an efficient corporate communication channel and that such efficient communication within the budgetary system has the potential to bring about a significant improvement in the system's effectiveness.

The communication process

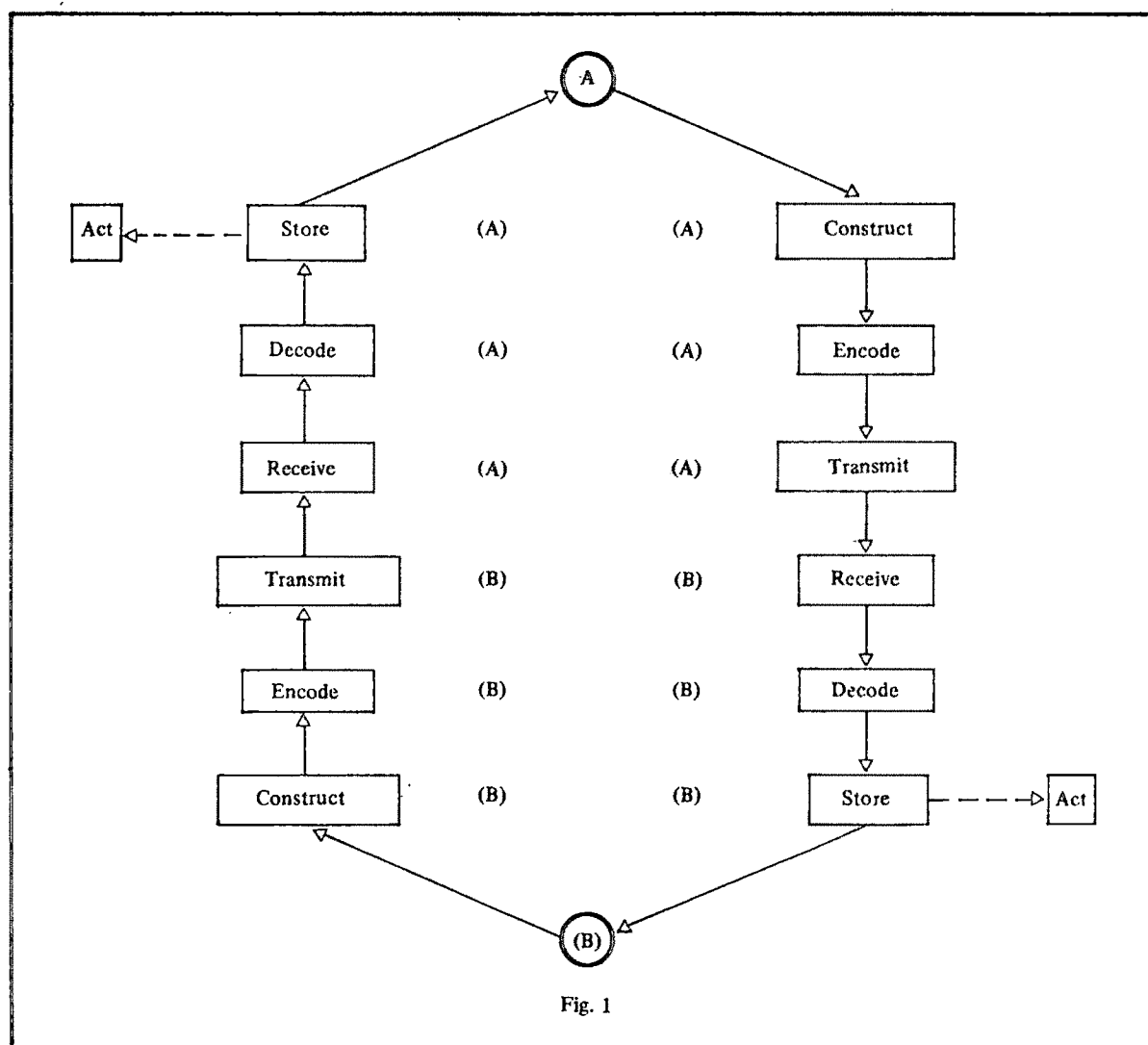
The Nature of Communication

Most accountants would hasten to agree with Yukl and Wexley's belief¹ that an enterprise requires accurate and speedy communication if it is to operate effectively. This applies equally to the budgetary system. Bavelas and Barrett² concur with this view and add that the enterprise can be seen as a network for collecting, evaluating, recombining and disseminating information. They further suggest that managers depend completely upon the quality, quantity and speed of information reaching them. Indeed, to Bavelas and Barrett, communication is the key activity of any enterprise and from it is derived most other activities.

As a starting point, it is useful to consider how communication actually takes place. The process can be understood by examining the steps involved in a two way communication between personnel A and B as represented in Fig. 1. This can be further explained as follows:

¹G. A. Yukl and K. N. Wexley, editors, *Readings in Organizational and Industrial Psychology*, Oxford University Press, 1971, p. 53.

²A. Bavelas and D. Barrett, 'An Experimental Approach to Organizational Communication', in Yukl and Wexley's *Readings in Organizational and Industrial Psychology* pp. 57-62.



A constructs: A develops an idea and considers its destination, purpose and impact.

A encodes: A creates a message in one or more media.

A transmits: A sends the message to B.

B receives: B accepts transmission.

B decodes: B translates the message into a form which he understands and finds meaning in it.

B stores: B retains the information for present or future action.

B acts: If action is required immediately, B takes appropriate action.

B constructs: Should he feel that circumstances require it, B develops an idea, considers its destination (i.e. A), purpose and impact.

B encodes: B creates a message in one or more media.

B transmits: B sends the message to A.

A receives: A accepts transmission.

A decodes: A translates the message into a form which he understands and finds meaning in it.

A stores: A retains the information for present or future action.

A acts: If action is required immediately, A takes appropriate action.

The critical problem for the accountant is the meaning which people may deduce from his communications in the budgetary system. Caplan³ outlines three different meanings which a communication can have:

1. That which A intended to send.
2. That which is actually in the message.
3. That which B (the recipient) perceives.

He therefore claims that the only one of these which has significance for the accountant (when acting as A) who wishes B (the recipient) to take certain actions in the budgetary context, is 3 above. The accountant must always consider how his messages will be perceived by the recipients since the meaning which his communications have for them will determine their actions. How operating

³Edwin H. Caplan, *Management Accounting and Behavioural Science*, Addison-Wesley, 1971, p. 54.

personnel perceive his communications will, for example, determine at least in part the extent to which they will be predisposed to feed back information concerning budget variance causes. A and B's encoding and decoding (shown in Fig. 1) therefore assume critical importance in this context.

Another immediate problem in the communication process is that of so-called noise which may interfere with the transmissions between A and B. The result may be that the recipient may not receive the message at all, may receive only part of it or may not receive it in the sense intended by the sender. Byrt⁴ places the causes of noise in two categories:

Physical Causes

- e.g. Faulty telephone connection
- Illegible handwriting
- Noise while speaking

Psychological Causes

- e.g. Differences in parties' education, social background, status, etc.
- Distrust, dislike, fear
- Emotions and hopes of the parties
- Differences in the values of the parties
- Purpose of communication and how it is perceived.

These observations are critical for the accountant who is trying to communicate effectively with personnel involved in budget planning and follow-up. Byrt also suggests ways in which he can determine how his messages have been received. He can observe expressions and reactions of recipients, examine recipients' replies, discuss with third parties who have observed the communication taking place or ask for reports of some description. By this process, the accountant can try to establish empathy with recipients so that he may determine how to improve his communications with them in the budgetary system. This establishment of empathy could be said to lie at the very heart of the communication process in view of Smith's⁵ observation that the English term 'communication' is derived from the Latin term 'communis' meaning common. Effective transmission of a message requires the sender to establish some common ground with the recipient. This could well be a strong argument for the accountant trying to improve his informal relationships with the operating personnel with whom he is trying to communicate.

From this brief outline of the communication process, the tasks of encoding, transmitting and decoding of messages emerge as critical to the

success of both upward and downward budgetary communications. An understanding of causes of noise can assist accountants in all three of these communication tasks as a first step towards rendering their communications to line personnel more effective and better understood. This is an essential preliminary to any hoped for improvement in upward budgetary communications from line personnel. An understanding of line personnel's patterns of encoding and decoding of budget related messages would be a decided advantage here.

Communication Influences

Each individual unconsciously makes various erroneous assumptions and holds certain fallacious beliefs. These, Haney⁶ points out, can affect a person's decoding and encoding and cause miscommunication. Communication is not simply a matter of choosing techniques, media and devices but involves the effects upon communicators of their social relationships, the nature of the company in which they work and the social environment. Indeed it is often difficult for the individual to perceive reality due to the interference of different environments, personal predispositions and limited ability to interpret events and communications. This range of human limitations is appropriately touched on in St. Paul's statement that 'For now we see through a glass darkly'.⁷ Thus communication cannot really escape being affected to some extent by the limitations of the human mind.

As Haney further points out, every individual maintains some sort of self image which he or she does not wish to change. This can affect a person's ability to understand other people's behaviour and it determines to a large extent what each individual perceives as 'reality'. This again is another prime factor affecting communication. Here lies the basic argument for the accountant's need to look beyond his standard professional orientation and to try to understand his own limitations and the way in which others perceive him. His findings may well provide him with some idea of the approach to his communications which would best encourage better budget-

⁵C. W. Smith, G. P. Mead, C. T. Wicks, and G. A. Yewdall, *Management Information - Its Computation and Communication*, Pan Books Ltd., London, 1969, p. 181.

⁶William V. Haney, *Communication and Organizational Behaviour. Text and Cases*, Richard D. Irwin Inc., 1973, pp. 55-63.

⁷*The First Epistle of Paul the Apostle to the Corinthians*, Chapter 13, beginning of verse 12. A more modern translation appears as 'Now we see bewildering shadows in a mirror', in William Barclay's, *The New Testament: A New Translation*, Vol. 2, Collins, 1969.

⁴W. J. Byrt, 'Management Through Communication', *Personnel Practice Bulletin*, Australian Department of Labor and Immigration, December 1974, pp. 322-332.

related communication. Tredgold⁸ lists some factors which affect the way in which the recipients of a communication perceive it:

1. The recipients' like or dislike of the sender.
2. The recipients' acceptance or otherwise of the sender's expertise in the field.
3. The suitability of the style of communication for the recipients.
4. Any antagonism which the communication causes.
5. The communication's proximity to the interests of the recipients.
6. The medium used for communication.
7. Any encouragement for recipients to contribute to the subject of the communication.
8. The usefulness of the material being communicated.

As pointed out earlier, it is critical for the accountant to consider the meaning which recipients will perceive in his communications and an examination of the above factors will be of some assistance in his attempts to predict the meanings which recipients will perceive in his communications. This in turn may allow him to construct his communications so that recipients perceive the meaning which he intends. By the resulting reduction in communication ambiguity, he will have taken the first steps towards improving the clarity of budget discussions and reports.

Structure

Of course there can be external factors affecting communications in an enterprise. Weick⁹ suggests that the flatter the organisation, the less likely it is that communications will be distorted, since they have to pass through a lesser number of people than is necessary in a company with a tall structure (i.e. a large number of hierarchical levels). He goes on to suggest that the flatter the structure of an enterprise, the more likelihood there is of informal contacts and relationships being formed between personnel. If the accountant is awake to this possibility, he may use a flat structure as an opportunity for opening up informal channels of communication with various levels of line personnel involved in the budget process. Wilensky¹⁰ points to another influence on communication when he states that decisions involving many people or uncertainty (which could well include budgeting) can increase the dangers of

overload, distortion or blocking of communication between various personnel or sectors within the enterprise. This could even point to problems occurring in the use of participation in the budget process should the accountant choose to involve a large number of personnel.

Technology

Woodward¹¹ found in her study of firms in South Essex, that technology influenced communications even within companies. In firms employing both least and most technologically advanced equipment, methods etc., communication tended to be oral while it tended to be written in firms at the middle of the 'technological scale'. The volume of paperwork increased as technology became more advanced and reached a peak in assembly-line production companies but tapered off after this point. Her researchers gained the impression that the tendency to communicate in writing was related to the stresses involved in batch production, especially as it was felt that the conflicts between line personnel and staff specialists encouraged personnel to safeguard themselves against possible subsequent disputes by committing all communications to writing. It is possible that should operating personnel fear some form of censure for unfavourable budget variances, they may similarly only communicate in writing as a form of defence. This could further restrict the flow of information concerning budget targets and results and therefore the accountant might prefer to avoid the encouragement of only written communication between personnel involved in the budgetary system.

Unions

The union presence may also be a factor affecting communication. Upward communication in the enterprise may be restricted if a low trust atmosphere exists between unions and management. To increase budget feedback, therefore, the accountant may need to initiate communications to personnel via the existing union machinery in the company. For instance, Alan Fox¹² cites an account given by Guest of a change in management in a mass production car assembly plant. When the management was changed, a shift from a punitive, low-trust pattern of relations to a participative, high trust pattern of relations was observed. In the low trust situation, there was much distrust, restriction of personnel discretion, close

⁸R. F. Tredgold, *Human Relations in Modern Industry*, Gerald Duckworth & Co. Ltd., 2nd edition, 1963, pp. 101-102.

⁹Karl E. Weick, *The Social Psychology of Organizing*, Addison-Wesley, 1969, pp. 6-7.

¹⁰Harold L. Wilensky, *Organizational Intelligence*, Basic Books Inc., New York/London, 1967, p. 78.

¹¹Joan Woodward, *Industrial Organization - Theory and Practice*, Oxford University Press, London, 1965, pp. 66-67.

¹²Alan Fox, *Beyond Contract: Work, Power and Trust Relations*, Faber and Faber Ltd., 1974, pp. 137-142, citing R. H. Guest, *Organizational Change: The Effect of Successful Leadership*, Tavistock, 1962.

supervision, reliance upon prescriptive rules, reliance on authority and threats of censure. When a new management was introduced, a non-punitive, high trust, supportive style was initiated. The top manager initiated consultations with all levels of management and the unions relating to long term plans for the plant. As a consequence it was observed that an increase in vertical and horizontal communication of technical and administrative information took place. Regular meetings were held with open discussion of issues. Foremen appreciated the absence of blame placing and the new atmosphere of problem solving. Union representatives relaxed their previously prescriptive approach to issues involving their members and worked more in a spirit of give and take. The necessity of a trusting and supportive atmosphere being generated in the company before communications can be improved is inherent in this case and will be later emphasised in this study. Nevertheless, this case shows one way in which communications with union representatives, and at the same time middle management, led to an increase in upward communications (as well as in other directions) and avoided the alienation of foremen and other levels of management. The danger of alienating foremen in improving communications through union representatives cannot be underestimated. Poole¹³ cites the case of the ICI Gloucester Nylon Spinning plant in this regard. Shop floor discussion groups and joint union-management working parties caused supervisors to feel that their status and security was being threatened. Some left ICI and others experienced great strain in adjusting to the new situation. Therefore the accountant would do well to recognise that the union can directly affect budget feedback and can have a positive role to play in the communication process. Nevertheless, any innovation in communication involving union representatives in a company must also make some provision for simultaneous communication with foremen and other supervisory personnel if they are not to feel threatened. If the perceptions of such middle management are ignored, they may well cause a breakdown in a communication process which had previously been functioning effectively.

As a final comment upon the union influence in communication, it is interesting to note some of the advantages and disadvantages cited by Davis.¹⁴ The

union does provide an established channel of communication upon which employees already depend and should the union representatives attest to the validity of any information passed down, its acceptance by employees will become more certain. If union representatives are ignored, they may reinterpret the information going to employees and distort the meaning intended. However it must be remembered that the union machinery may have its own communication problems and if overloaded with additional budget-related communications will probably give them low priority and may distort them even if transmitted. Nevertheless, as was pointed out earlier in this study, shop stewards have considerable access to personnel at shop floor level and, if they are willing to become involved in the budget communications channels, could provide a direct link to operating personnel.

Communication Failures

The primary sources of failure in communication are the human frailties of the people involved. Tricker¹⁵ claims that the individual tends to use only figures and data which support his preconceived ideas, fails to study all the factors involved in any situation and has a limited capacity to deal with any sizeable volume of data. The general sources are identified by Davis¹⁶ as being:

1. Physical – distance, noise, etc.
2. Human – social values, emotions, judgements, mental ability, etc.
3. Semantic – limitations of the symbolic medium used.

Causes and failures in this area have also been examined by Wilensky.¹⁷ A tall organisational pyramid with numerous hierarchical layers can block upward communication. A large number of departments, accompanied by specialisation and rivalry, can lead to the generation of irrelevant information and the separation of experts from decision-making. Personnel who collect information may be excluded from interpreting it, an emphasis on secrecy or confidentiality of information may blind managers to superior official sources, impair critical judgement or lower enterprise morale, while a stable, slow growth company may result in any discussions being more formal and rank-oriented. These general difficulties must be recognised and faced by the accountant if he really intends to use communication as an instrument for the improvement of budget feedback.

¹³Michael Poole, *Workers' Participation in Industry*, Routledge and Kegan Paul, London and Boston, 1975, pp. 60–61.

¹⁴Keith Davis, *Human Relations at Work – The Dynamics of Organizational Behaviour*, McGraw-Hill, 1967, pp. 349–350.

¹⁵R. I. Tricker, *The Accountant in Management*, B. T. Batsford, London, 1967, p. 84.

¹⁶Keith Davis, op. cit., p. 325.

¹⁷Harold L. Wilensky, op. cit., pp. 42–48, 175–178.

Wilensky goes on to explain the problem with what he calls 'organisational intelligence' by pointing to hierarchy, specialisation and centralisation as the basic causes of communication blockage and distortion. Since information can be used to create status, increase personal authority and further personal career prospects, a hierarchical structure is conducive to information concealment and manipulation, especially as subordinates are often asked to pass up information which will be used to assess their own performance. Not only do personnel restrict information for these reasons but also to maintain comfortable work situations for themselves. Wilensky cites an unpublished study of 52 middle managers carried out by W. Read, University of Michigan, in 1959, where it was found that there was a strong positive correlation between upward job mobility and the holding back of information from higher levels in the hierarchy of the enterprise. Managers being promoted periodically restricted the upward flow of information concerning matters such as disputes with other departments, unforeseen expenditures, problems with work flow, inadequate time for personnel training and insufficient supplies, equipment etc. This sort of situation can easily occur in the budgetary system and constitutes the most visible evidence of a breakdown in budget feedback. As Wilensky clearly points out, middle managers and lower-level employees have a near monopoly of insight into feasible alternative operating strategies, unofficial working procedures and drawbacks in the technical system. Such shop-floor expertise and knowledge is a vital element in any budgetary system where planners are striving to develop budget targets which approach some measure of realism in relation to the enterprise and its environment. When such information is made unavailable by the breakdown of budget feedback, the usefulness of the whole budgetary system must be seriously called into question.

Read¹⁸ himself has further argued that inaccurate upward communication will increase when subordinates do not trust their superiors and indeed he claims this to be the single greatest cause of malfunctioning of upward communication in the enterprise. The reduction of any atmosphere of mistrust in his company may be the first task of the accountant in trying to improve budget feedback and it may be a daunting one since the total remedy may not be entirely within his jurisdiction. Lack of trust may go hand in hand with a competition among personnel for power within the enterprise. Read sees communicators as withholding information which is potentially

threatening to their status, while Simon¹⁹ sees enterprise members building up the informal communications network as a means of securing power within the enterprise for themselves. Thus the accountant's attempts to improve informal communications in the enterprise may be resisted for reasons totally unconnected with the budgetary system and in that case he may find difficulty in using the informal communication network as an aid to the improvement of the budget system.

Even if the above-mentioned problems are not present in the enterprise, the worker may find it difficult to initiate upward communication since he feels that he talks and dresses differently from the manager. The manager is able to call the worker to his office, go to a worker's department and has more communication media available to him. The worker enjoys none of these advantages and hence upward communication is subject to inherent limitations which the accountant can only offset by concerted and positive action to improve opportunities for and reduce the drawbacks of upward communication. Davis²⁰ claims that even when upward communication does take place, its progress may be slow since each level in the hierarchy will try to solve the problem itself because it regards the passing up of problem-related information as an admission of failure. The response appears in Wilensky's²¹ suggestion that personnel at the top of the hierarchy fear that they are being 'kept in the dark' and therefore stress company loyalty and the standardisation of employee responses, which in turn stifles the introduction of fresh slants, new ideas and constructive criticisms from lower ranking personnel. Thus the task which the accountant may really face could be the breaking of a vicious circle. Nevertheless, his improvement of upward communication could be said to constitute the improvement of budget feedback itself and as such it could well be argued that, no matter how daunting the task, it is one which the accountant cannot avoid tackling.

Human Limitations

Of course communication difficulties can simply be caused by human limitations. Davidson and Trueblood²² recognise the dangers of the provision of excess or insufficient information to enterprise

¹⁸W. H. Read, 'Upward Communication in Industrial Hierarchies', in Yukl and Wexley, op. cit., pp. 79-81.

¹⁹Herbert A. Simon, *Administrative Behaviour*, Macmillan, New York, 1954, p. 161.

²⁰Keith Davis, op. cit., pp. 343-344.

²¹H. L. Wilensky, op. cit.

²²H. Justin Davidson and Robert M. Trueblood, 'Accounting for Decision-Making', in Alfred Rappaport, *Information for Decision Making: Quantitative and Behavioural Dimensions*, Prentice-Hall, 1970, pp. 22-23.

personnel. Yukl and Wexley²³ explain that a person can receive, interpret and act upon only a limited amount of information in a given period of time. If a person finds that he cannot cope with the amount of information being fed to him he may react by randomly rejecting a certain percentage of messages sent to him with the result that important information may be lost, or he may try to process the information at a faster rate with the result that he may begin to make significant errors of interpretation. Insufficient or inadequate information may take the form of stock information being given to supervisors in £s instead of units, labour costs instead of labour hours being detailed, etc. Thus the problem which faces the accountant in this respect is one of achieving a balance between over and under-information. One part of the remedy may be supplied by the accountant's paying attention to the timing of his communications. As Smith suggests²⁴, he could try to avoid competing with messages flowing from outside the budgetary system. He might also find that he has been regularly supplying information that has only been required irregularly or he might find that he has been providing information too often or too late. Indeed he may even have fallen into the trap of supplying budget variance figures to operating personnel so late, that the onset of the new operating period has given them no time to investigate the causes of these variances for the now past budget period. It would seem therefore, that with some careful thought, the accountant has the resources to overcome many problems of over or under-communication.

Haney²⁵ has examined another group of causes of communication failure. Bypassing occurs when individuals refer to an apparently common topic but in fact have in mind different subjects. The message sender and receiver may understand different meanings when for instance the accountant hands the latest labour variances to the plant manager and asks him, 'can you check on these variances please?' meaning that he should investigate the causes, while the plant manager understands the accountant to mean that he should simply recheck the data used to compute the variances against the original source data contained in his own plant records. Bypassing can easily occur when two people use the same words to mean different things. The accountant should take care with his use of terminology in budget communications. The question is once again one of establishing empathy with the recipients and under-

standing the meaning which they will perceive in any message. Of course the accountant must also try to understand what the senders of upward communications really mean, rather than simply interpreting the words of a message, be it oral or written.

The accountant should be wary of making statements which amount to broad generalisations which sound all-inclusive, positive and final and yet are partial abstractions of the whole truth. He may create considerable problems for budget feedback if he says 'Sales variances? District managers just don't want to know'. It sounds as if he is condemning all the district managers with a definite air of finality. There may in fact be exceptions. This all-inclusive inference may have been made unconsciously by the accountant or he may simply be using terms which emphasise the managers' similarities and neglect their differences. The accountant may try also to reduce every factor to a condition of 'black and white' when in fact it is more of a 'grey area'. For instance, he may correctly call a significant unfavourable variance 'serious' but ignore the fact that over the past few budget periods it has been steadily improving. Thus he has imputed a negative 'black and white' meaning to a subject which has both positive and negative aspects. This situation could also be said to involve the evaluation of a changed subject in an inflexible manner. The accountant has ignored the partly changed condition of the variance.

The accountant may make the mistake of applying a dyaphemism²⁶ to a situation or object which would be better served by a euphemism.²⁷ For example in a variance report to the warehouse supervisor, he may describe missing stock as 'filched goods' whereas if he is trying to encourage feedback as to the cause of the stock being missing, he might have chosen to describe it as 'stock shortage'. Finally, it must be remembered that the individual defines, delimits and classifies his experience and data to enable him to make decisions and deal with situations. The inherent danger in this is that by defining a problem the accountant may unconsciously restrict his perception of it and hence become inflexible in his approach to it. Certain aspects of the problem may therefore be neglected by him while, for instance in budget planning discussions, they may be the very aspects which concern the operating personnel involved. These various human difficulties in communicating identified by Haney can be critical in hampering the accountant's attempts to

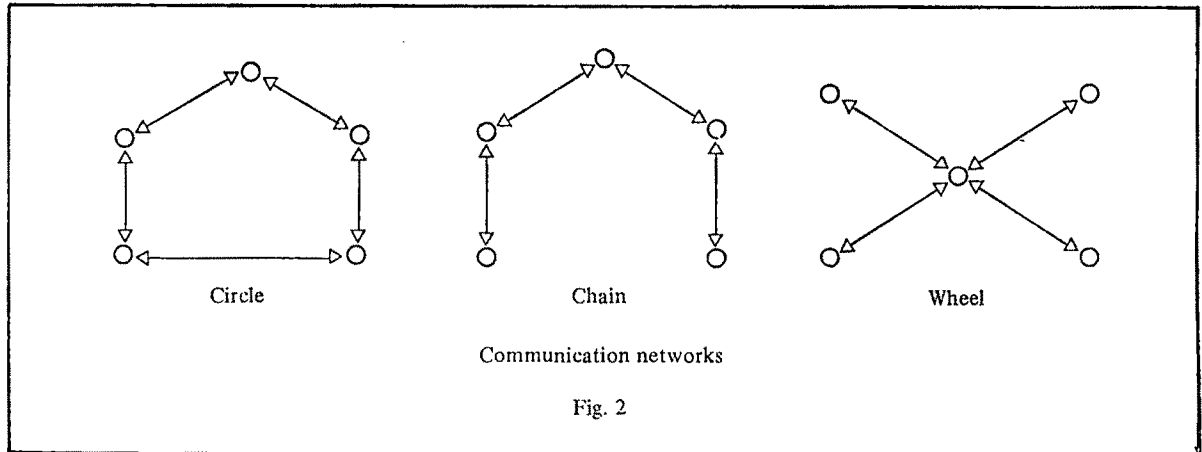
²³G. A. Yukl and K. N. Wexley, *op. cit.*, pp. 53-54.

²⁴C. W. Smith, G. P. Mead, C. T. Wicks, G. A. Yewdall *op. cit.*, p. 182.

²⁵William V. Haney, *op. cit.*, pp. 211-475.

²⁶Dyaphemism is the substitution of a term with unpleasant connotations for the usual descriptive term for a particular situation or object.

²⁷Euphemism is the application of a milder sounding term to an unpleasant object.



generate better budget communication even if he is falling prey to only one of them. The basic general remedy is for the accountant to become sensitive to his potential weaknesses in this area and to avoid them whenever possible.

Corporate Communication Structures

The accountant may find himself involved in a communication network which could resemble one of several patterns and could even find that he is involved in a whole array of various networks with different personnel and sections of his company. It may well be possible for the accountant to identify the networks involved in the budgetary system so that he can consider the strata of personnel with whom he has direct contact, the probability of information being 'screened' by intermediaries, the extent to which budget proposals can be discussed among operating personnel etc. Davis²⁸ has reported the effect of communication patterns on work performance under experimental conditions for a circle, chain and wheel network as shown in Fig. 2. The results appeared as follows:

	<i>Circle</i>	<i>Chain</i>	<i>Wheel</i>
Speed of performance	Slow	Fast	Fast
Accuracy	Poor	Good	Good
Emergence of leader	None	Marked	Very pronounced
Morale	Very good	Poor	Very poor
Flexibility to job change	Very fast	Slow	Slow

This once again poses the problem for the accountant similar to that posed by the more participative styles of budget planning. The circle network, while

increasing participants' morale, may be time consuming whereas the wheel, while producing budgets more quickly, may produce much less feedback regarding causes of budget variances. There seems to be no simple answer to this dilemma and possibly the accountant may find it best to foster a combination of networks in the budgetary system.

Why are these networks important to budgetary communication? Firstly it has been demonstrated that the type of network adopted can affect the ability to organise for successful task accomplishment. Secondly it has been suggested that the fewer the links between network points, the more effective communication will be, but that this may reduce the degree of satisfaction which personnel derive from the communication process.²⁹ It would appear therefore that the accountant is faced with the task of seeking some compromise budget communication structure which provides an efficiently operating budgetary system while at the same time allowing some satisfaction from the communication process to participants. For instance if lower level managers meet before drawing up their first draft budgets, a circle network of communication might be used for upholding morale and flexibility to changing conditions, while a chain network might be used for final revisions and master budget assembly when the budget committee becomes involved. Eventually when actual results are analysed and investigated, the circle network might be reintroduced. Such a suggestion is merely put forward by way of example and certainly could not purport to be a normative, universalistic solution to budgetary communication problems. In addition no consideration has been made of the extent to which such networks would be

²⁸Keith Davis, *op. cit.*, p. 322.

²⁹F. Luthans, *Organizational Behaviour: A Modern Behavioural Approach to Management*, McGraw-Hill, 1973, pp. 244-247.

formalised. Nevertheless, in this way a more coherent budgetary communication strategy can be formulated by the accountant who has some understanding of the communication networks operating in his company.

Within this context it is also important for accountants to identify formal and informal budget communication networks. The formal networks are embodied in the chain of command, procedural and organisational manuals.³⁰ Media of formal communication include official memoranda and letters, documents, manuals, records, reports etc. The informal communications system is built around social relationships between the personnel working in the enterprise. The main manifestation of the informal communication system is the so-called grapevine. Davis³¹ ascribes certain characteristics to it as follows:

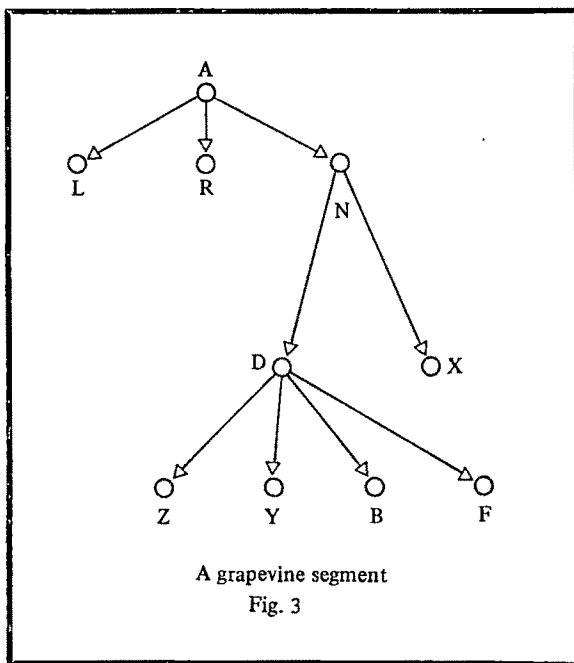
1. Fast speed of transmission.
2. Some degree of selectivity.
3. Usually takes place simultaneously with formal communication.

Nevertheless, Davis³² does argue that although information carried on the grapevine may be largely correct, it suffers from cumulative misinterpretations as information is passed from person to person. He

also suggests that the normal grapevine takes the shape of a cluster pattern such as the one shown in Fig. 3, because only a few persons are active communicators. A tells several people of whom only one tells several others and so on. Davis further suggests that people become active communicators in the informal network when they have cause to be. This can be anticipated by the accountant as in the circumstances where new budget planning procedures may be about to be introduced by him. Having anticipated this situation, he could introduce information into the informal network of communications himself and thus use it to provide operating personnel with realistic and accurate information.

The grapevine itself can be used to provide budget planners with feedback about variance causes and it can also be used as a translator of technical aspects of the budget into terms which operating personnel understand. Being by its nature personal, fast and flexible, the informal communication system can cut across formal boundaries within the company such as department, line and staff etc. Again this can be used by the accountant to reach operating personnel direct when the formal structure of the company might otherwise prohibit such contact. Of course the informal communication network can spawn rumours. Davis defines rumours as information passed on without definite evidence to substantiate it. Rumours result in information being reduced to a few basic points and being continually modified to fit each communicator's own viewpoint and may not even represent facts at all, but may simply be expressions of opinions or fears of various personnel. The accountant's entering the informal communication network himself may be one of the most promising possibilities for the diminishing of the ill-effects of rumour.

Here, then, is the basic nature of the general communication system operating inside the business enterprise. If the accountant intends to improve his communications with various personnel involved in the budgetary system, then he should first understand just how the communication system works. His understanding of the formal and informal structure of his company will assist him greatly in this respect. If the structure of his company is highly formalised, then he may, for instance, find the avenues for informal communication rather restricted. The essentials of effective communication such as ensuring that messages are understood by recipients as meant by the sender, the minimisation of noise and the establishment of empathy with recipients, should be practised by the accountant as a matter of course. His understanding of the various network configurations present in the budget process can only be of



³⁰J. A. Litterer, *The Analysis of Organizations*, John Wiley, 2nd edition, 1973, pp. 512-514.

³¹Keith Davis, 'Management Communication and the Grapevine', in G. A. Yukl and K. N. Wexley's *Readings in Organizational and Industrial Psychology*, pp. 94-95.

³²Keith Davis, *Human Relations at Work - The Dynamics of Organizational Behaviour*, McGraw-Hill, 1967, pp. 222-231.

positive benefit to his efforts to improve communication. In the first instance this would involve a brief study of the participants in, frequency of and direction of communication at each stage of budget preparation and review. At points of activity such as first line supervisor meetings, budget drafting, master budget coordination, budget committee meetings etc., prevailing communication patterns should be broadly identified. Are they wheel-task directed, or circle-group oriented? Are they predominantly formal or informal? Subsequently it can be determined whether communication is fast or slow, accurate or subject to filtering and distortions and so on.

The accountant's role

Oh wad some power the giftie gie us
To see oursels as ithers see us!
It wad frae monie a blunder free us,
An' foolish notion.

Robert Burns

In trying to improve communications between himself and other enterprise personnel, the accountant must realise that the effectiveness of his efforts in this direction will be directly affected by the way in which other personnel perceive him and his role. If the accountant is seen by operating personnel to be assuming the role of a managerial staff specialist, then their reactions to him and his communications will be conditioned accordingly. The accountant, as an employee of a company, can fulfill a variety of roles

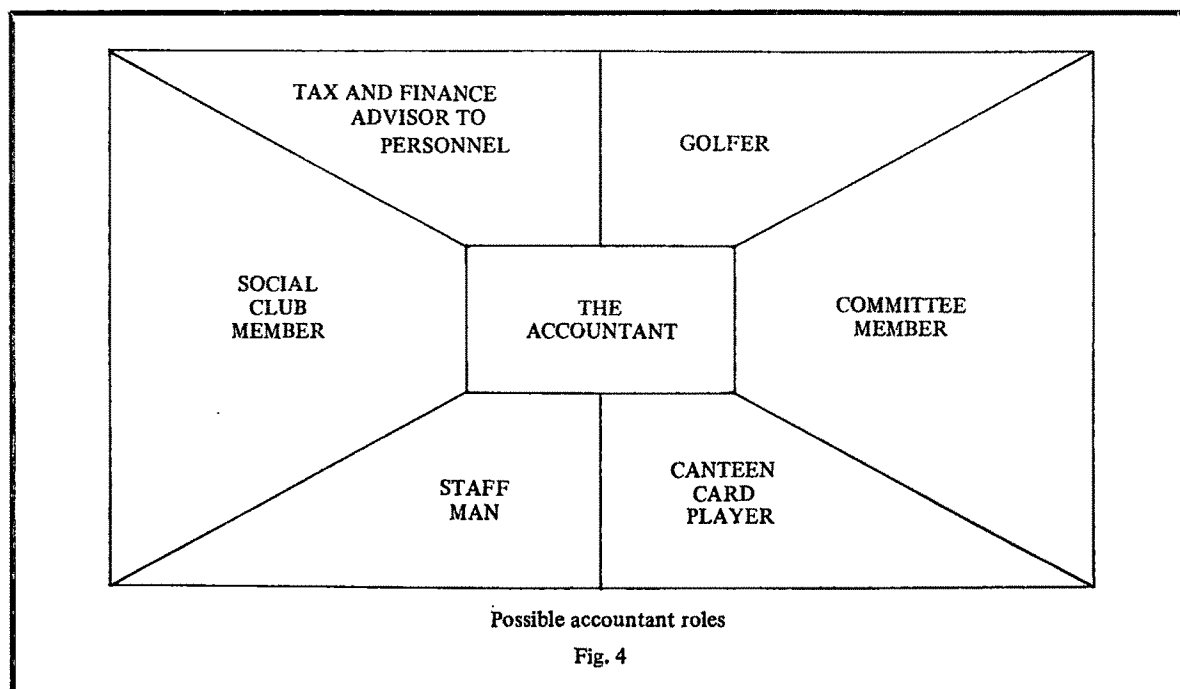
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as for example shown in Fig. 4. His communication with other personnel in some of his roles other than that of accountant may encourage more open communication channels within the informal structure of the company. What the accountant must realise is that communication involves interpersonal relationships, so that in part the improvement of his communication with other personnel involved in budgeting can be achieved by his improving his relations with them. As Tricker³³ says, the accountant's words, inferences and judgements can all influence other personnel and the impact of his behaviour upon others can radically affect the quality of information being communicated. Thus it would seem that simply by improving his relationships with line personnel, the accountant can immediately go some way towards improving the communications of line personnel within the budget process.

The accountant, as an information specialist, does have certain advantages in trying to improve budget communication. One of his main specialisms is communication and indeed Davis³⁴ suggests that he may be more motivated to communicate with other personnel because he does not have direct authority over line personnel. One further attribute to the advantage of the accountant is his greater mobility than other personnel. Thus he has more opportunity to foster his informal contacts and communications with all levels of personnel in the enterprise should he

³³R. I. Tricker, op. cit., pp. 271-272.

³⁴Keith Davis, op. cit. (note 32), pp. 346-347.



choose to do so. Of course, as Foy³⁵ points out, managers (and one might also include accountants) are often good at transmitting information but poor at receiving information. Indeed, the higher their position in the enterprise hierarchy, the less they may tend to listen to communications directed to them. The accountant should beware that he is not ignoring opportunities for receiving useful budget feedback already available.

Wilensky³⁶ identifies certain communication difficulties inherent in the specialist nature of such positions in the business enterprise as accountant. As a 'facts and figures man', the accountant may supply personnel with technical, economic and even legal information. He is skilled and mostly concerned in working with data, records and arguments while his skills in dealing with people are not so pronounced and, as some would maintain, sadly lacking. Nevertheless, the accountant does have the potential to introduce a rational base into many enterprise decisions and to encourage a reasoned examination of alternatives, especially in budget planning being done by operating personnel. A further problem centres upon the tendency of specialists within the enterprise to defend their 'own domains'. The personnel department defends its control over such areas as selection and training while the accountant tends to defend his standards of reporting and his position as the central figure in the company's financial information system. The difficulty created by this situation is that specialists become narrow in their interests and cut off from information about other activities in the enterprise so that eventually the professional producer of information (e.g. the accountant) becomes isolated from the information user. This could have implications for the accountant who does not show any interest in communicating information (such as general economic conditions) to personnel requiring it to assist their budget planning. Should he be seen by operating personnel to be deficient in providing such communications, they may feel little incentive to provide information concerning the budget for the general discussion of all parties involved in the budget process. For the large corporation, Wilensky suggests that some communication difficulties might be overcome by seconding accountants to work on the factory floor under the control of the factory manager although still owing some allegiance to the finance department. This would place accounting personnel closer to actual operations and enable them to achieve closer and more informal

contact with operating personnel. This can have the dual advantage of acquainting operating personnel with the role and information products of the accountant and thereby building their confidence in the budgetary system, and also stimulating more communication of information only known at shop floor level.³⁷

From the foregoing discussion it is possible to see the vital role of the budget as a communication device in itself and therefore, as Goodlad³⁸ has urged, regular contacts between accounting staff and line personnel should be encouraged. In their survey referred to earlier, Sord and Welsch³⁹ disclose that 83% of respondents said that they did feel that budgeting improved communication and understanding of departmental and company plans. Interviews also revealed that supervisors were most interested to know where their contributions fitted into overall plans. This sort of information could easily be supplied by the accountant and assist in creating an atmosphere in which communication channels become more open and operating personnel feel more disposed towards investigating and disclosing budget variance causes. With the likelihood that many enterprise personnel see the budget as a communications device (rather than the traditional accounting emphasis of its control role), it seems logical that the accountant should foster its communicating characteristics as a means of directly improving budget system effectiveness. In view of the numerous discussions, meetings, and personal contacts that must take place during the development, implementation and follow up of any budget, this task should present the accountant with no great problems. His opportunities for improving communications seem numerous.

The idea of installing accountants in manufacturing plants is also supported by Odom⁴⁰ who has recounted a situation of this type which he observed in a company. In this way, he claims, accountants gained information from the shop floor which they could not obtain simply by examining manufacturing tickets. Furthermore they became members of a group within the plant, with operating personnel being more frequently drawn in to take part in such tasks as rate setting. Tricker⁴¹ has also presented a

³⁷See Organisation Charts: Fig. 5 and Fig. 6.

³⁸J. B. Goodlad, 'Budgeting Aid to Improved Human Relations', *Management Accounting* (UK), June, 1972.

³⁹B. H. Sord and G. A. Welsch, *Managerial Planning and Control: as Viewed by Lower Levels of Supervision*, The University of Texas, 1964.

⁴⁰G. T. Odom, 'Employee Information System', *Management Accounting* (USA), January 1973.

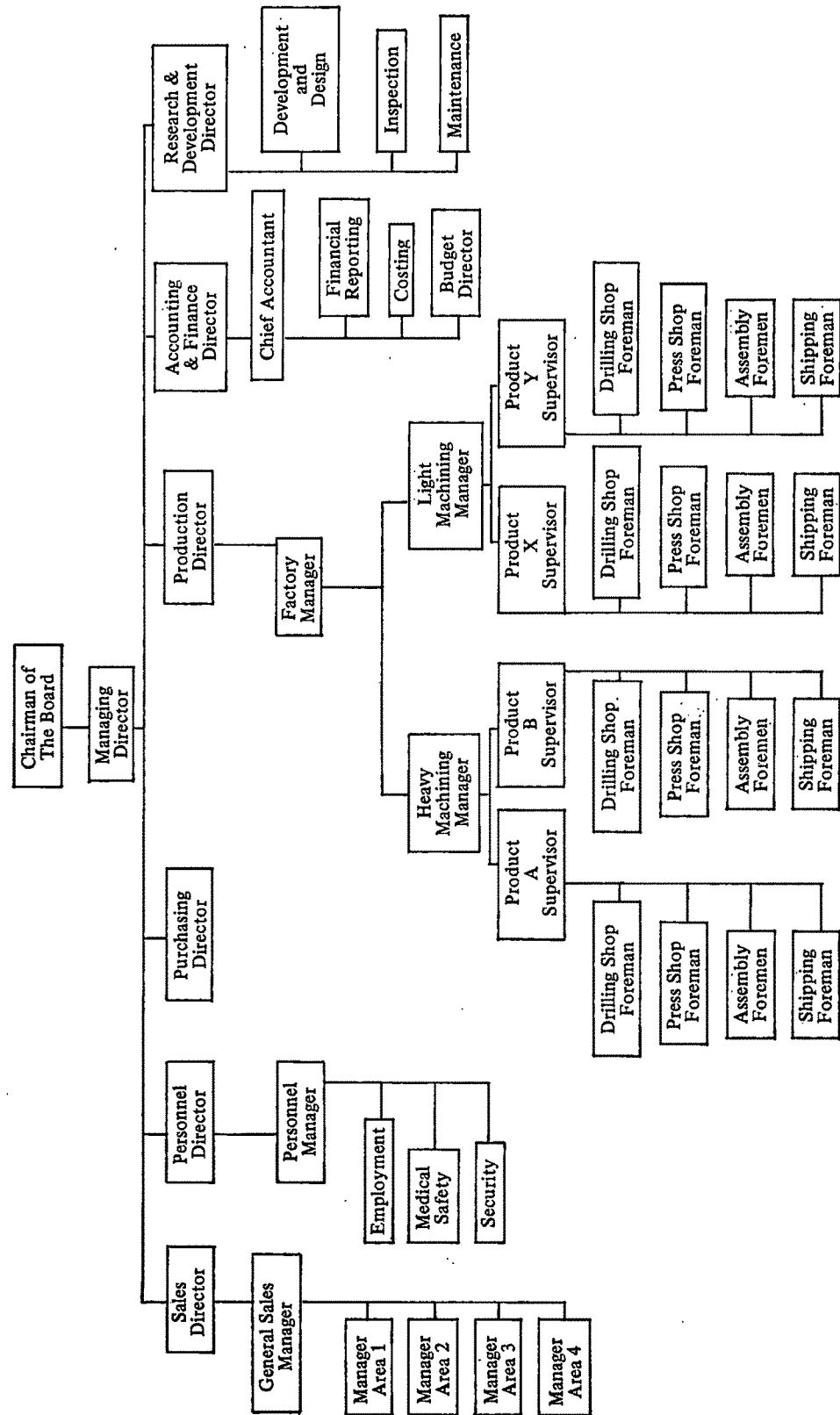
⁴¹R. I. Tricker, op. cit., p. 123.

³⁵Nancy Foy, 'Pathways to Participation' *Management Today*, January, 1974.

³⁶Harold L. Wilensky, op. cit., pp. 13-16, 48, 50, 61-62.

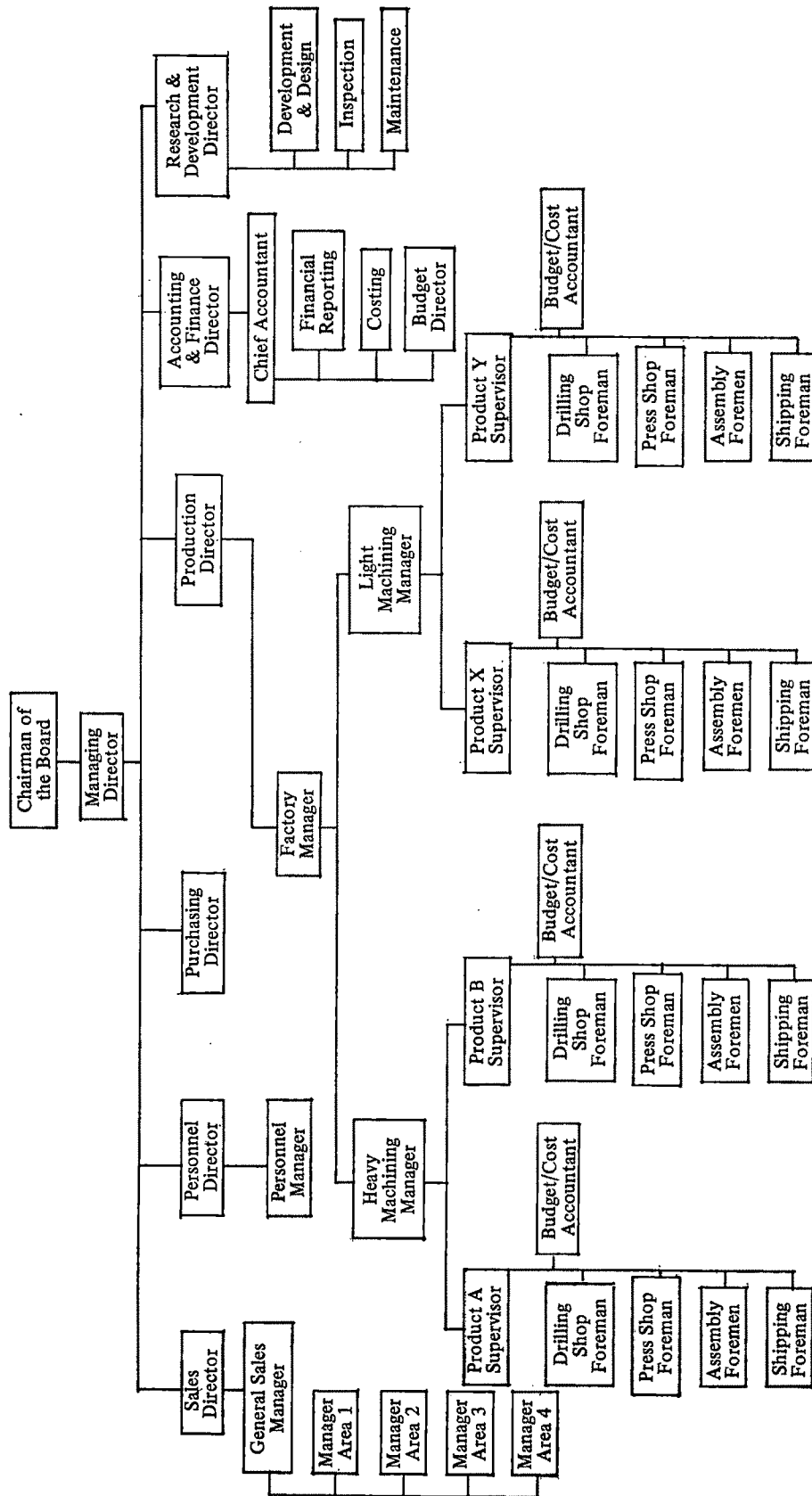
Organisation Chart – Accountants in Self Contained Staff Departments

Fig. 5



Organisation Chart – Some Accountants Seconded to Line Departments

Fig. 6



sample of the type of situation in which the accountant might improve communications. Should he analyse clock cards and find that the amount of overtime hours worked in a particular plant has been excessive, he might inform the appropriate manager by one of the following methods:

1. Send him the clock cards.
2. Write a memo to him.
3. List overtime hours on a schedule.
4. Telephone the manager.
5. Wait and see the manager at the social club.
6. Inform the managing director.

His choice of communication method might be dictated by his consideration of the possible reaction of the manager concerned. Should he cause him to feel resentful because he detects an implied criticism in the communication, or feels that he has been bypassed or fears that he faces censure, then feedback is quite likely to break down. Communication is a two-way process in which thoughtful downward communications by the accountant will assist in stimulating more open upward communications by other personnel.

Improving communication

A Positive Approach

Armed with a reasonable understanding of his company's communication system, the accountant must then turn to consider how he may best use it as an aid to the improvement of budget system communications. Davis⁴² lays down some prerequisites for effective downward communication:

1. The communicator (in this case the accountant) should ensure that he is informed about the subject with which he is dealing in the communication.
2. The communicator should develop a positive attitude and should share information with operating personnel to the extent that they think they need it, so that not only will they be informed but they will also feel informed.
3. The communicator should develop certain communication patterns so that personnel expect to be informed.
4. Information communicated to operating personnel should be governed by two standards:
 - (a) It should concern matters which affect them directly;
 - (b) It should reach them as news rather than stale information already learned from other sources.

Once again it must be stressed that the accountant

cannot expect to be blessed with useful budget feedback (i.e. a component of upward communications) if he does not communicate effectively to operating personnel himself. If the accountant has confined his understanding of the company's operations to an understanding of the mechanics and basic components of budget variance analysis, then he cannot hope to communicate effectively with the personnel who have the operational expertise. If he shows no understanding of their position, then they are unlikely to be interested in explaining their knowledge of the possible causes of budget variances to either him or those involved in budget planning. If they themselves are involved in budget planning, they still may not bother to apply their knowledge to the planning process. Prerequisites 2, 3 and 4 suggest that the accountant must canvass operating personnel from labourers upwards to find out what information they would find useful for him to supply to them. This might even extend to information outside that directly involved in the budgetary system. Nevertheless if the provision of such information helps create an atmosphere of greater trust and openness in budget communication, then the accountant might well consider it a useful step.

Building Upward Communication

Before further considering how the accountant can improve his own communications, it is important to remember that he must always be receptive to communications directed by operating personnel to himself. He could make efforts to have an 'open door' policy not just in name only but in reality. He can take steps to encourage personnel to approach him should they wish, at any time. This will be of little use however, if personnel find that he is indeed approachable but then has a closed mind to any of their suggestions, criticisms etc. He must not only be approachable but also receptive to new ideas if an 'open door' policy is to be effective. His approachability might be further enhanced by his participation in social groups within the company. His presence at informal gatherings provides opportunities for personnel to initiate spontaneous upward communications.

Rogers and Farson⁴³ provide some further advice concerning receptivity to communications which might also be of use to the accountant. They claim that when people are listened to in a sensitive manner, they will tend to listen to themselves and explain their feelings and thoughts more clearly. Thus by demonstrating a positive and attentive attitude to

⁴²Keith Davis, op. cit., pp. 339-341.

⁴³Carl R. Rogers and Richard E. Farson, 'Active Listening', in William V. Haney, op. cit., pp. 85-101.

communications directed up to him by operating personnel, he may cause them to improve the quality of their own communications. When personnel feel that the accountant is giving them an understanding hearing, they will be encouraged to communicate more clearly and openly. What Rogers and Farson argue for is the creation of an atmosphere of freedom, equality, permissiveness, understanding and acceptance.

Active and effective listening for the accountant really entails his thinking with personnel instead of for or about them. It is a matter of grasping operating personnel's point of view, and as has been previously pointed out, this can be best achieved by the accountant striving to achieve some degree of empathy with operating personnel. If the accountant listens effectively to upward communications and is seen by personnel to be doing so, then by the simple act of listening, he will be communicating to personnel that he respects them, values their ideas and considers them to have a role of some importance. For his informal verbal encounters with operating personnel in the budget process, the accountant might well take some of Davis'⁴⁴ instructions for effective listening:

1. Stop talking.
2. Put the other person at ease.
3. Show him that his communication is welcomed.
4. Remove distractions.
5. Empathise with him.
6. Be patient.
7. Avoid argument and criticism.
8. Ask questions.
9. *Stop talking!*

Likert's⁴⁵ 'linking pin' concept also assumes importance here in stressing the importance of subordinates' perception of their capacity to exert upward influence in the organisation. The maintenance of upward communication in the corporate budgetary system requires the effective operation of groups involved in budget planning, drafting, coordinating, revising and reviewing and also requires the effective interlocking of these various groups. Group meetings between superiors and subordinates at various hierarchical levels in the budget process will play a key role in the maintenance of effective upward communication.

Indeed the building of more effective upward communication often amounts to a process of

removing barriers.⁴⁶ Physical distance between the accountant and subordinate line staff, organisational complexity and movement of information through many hierarchical levels are immediate barriers to be overcome. Furthermore, accountants should remember that the absence of complaint or criticism from first line managers may be a symptom of poor upward communication rather than an expression of general satisfaction with the budgetary system. Listening of course takes time, but as Hofstede⁴⁷ has suggested, accountant should reserve a significant proportion of their weekly working hours for discussing problems with line personnel. Even then, further barriers may reduce upward communication. Accountants may be defensive about their views and actions when their appropriateness is questioned by line personnel and line personnel may consider that accountants are unable to identify with line problems and that they fail to remedy undesirable situations pointed out to them. The task of improving upward communication within the corporate budgeting system therefore involves operating upon both positive and negative aspects. The negative barriers to upward communication must be minimised where possible in order to open the way for accountants to take positive initiatives to encourage an increase in the upward flow of budget related information and opinion. Both strategies are essential components of any such programme.

Improving Downward Communication

Given that he makes an effort to foster upward communications, what concrete steps can the accountant take to better his own communications? Firstly he would do well to note the need pointed out by Taylor and Watling⁴⁸ that the effectiveness of communication depends on how credible the sender is in the eyes of the receiver. A considerable level of credibility in the eyes of operating personnel could be won by the accountant in his encouragement of upward communications. Operating personnel are seeking timely, factual and unambiguous information so that in writing or speaking the accountant should aim for clarity and avoid the use of jargon or the introduction of undue complexity. Byrt⁴⁹ also suggests that the message sender should not try to

⁴⁴Keith Davis, op. cit., p. 333.

⁴⁵R. Likert, *New Patterns of Management*, McGraw-Hill, 1961, pp. 113-115.

⁴⁶E. G. Planty and W. Machaver, 'Stimulating Upward Communication', reprinted in H. G. Hicks (ed.), *Management, Organizations and Human Resources: Selected Readings*, McGraw-Hill, 1972, pp. 218-224.

⁴⁷G. H. Hofstede, *The Game of Budget Control*, Tavistock, 1968, p. 300.

⁴⁸W. J. Taylor and T. F. Watling, 'How to Communicate Well' *Accountancy*, February 1973.

⁴⁹W. J. Byrt, op. cit.

disguise any lack of mastery of the subject being discussed by using abstruse language. This really reinforces the requirement that the accountant should make himself thoroughly familiar with the subject of his communications in the budget process. The use of pictures may clarify his communications, especially to shop-floor personnel, but he should be careful not to convey inaccuracies. Taylor and Watling argue that the use of telephone and personal contact are more effective communication methods than such media as written memos and certainly this would befit any attempt by the accountant to improve informal communications within the budget system. However in this sort of situation, the accountant must take care with his use of language, not only to avoid committing such errors as bypassing mentioned earlier, but to avoid arousing the emotions of other personnel when it has not been his intention to do so. The use of neutral terms in contentious matters and the explanation of his message's contents by means of examples, are two helpful possibilities.

Both Davis and Byrt make recommendations as to the contents of written communications of which the accountant might well make use. Basically effective writing is a matter of fitting the recipient's needs. Once again it is wise to avoid wordiness, jargon and pretentious words. The use of familiar words, short sentences and paragraphs, personal pronouns (e.g. you, we, etc.), illustrations and examples and a logical, direct style, will all add to the clarity of the accountant's written communications. Byrt and Davis also emphasise the role of (in this case) the accountant's actions as a medium of his communication. He communicates by his actions continually throughout his working day whether he intends to or not, since his actions are open to the interpretation of others. This only serves to demonstrate the importance of the accountant maintaining an openly positive attitude towards budget communications. In this way he can try to create a forum where personnel involved in the budget process can interact and exchange information and ideas with impunity.

Tricker⁵⁰ and Simon⁵¹ both list the basic communication resources which are available to the accountant and to other personnel involved in the budget process:

1. Oral communications can be carried on by means of personal face-to-face conversation, meetings, lectures, telephone, television and tape recordings.
2. Visual communications can take the form of documents, memoranda and reports, manuals,

computer printouts, telex, display charts, photographs and posters etc.

Fenn and Yankelovich⁵² have described a number of specific devices which they have observed in companies and some of which might prove useful in the budgeting context. Some companies have provided a special telephone number and preprinted forms for shop-floor personnel to use for upward communications, others have run 'cracker barrel' meetings on a regular basis between first-line supervisors and their subordinates, some have set up non-management task force groups to deal with specific problems, some have maintained ombudsmen throughout the enterprise and others have used existing committees to deal with matters which would normally have been outside their scope. Some combination of these experimental devices and those listed by Tricker and Simon would enable the accountant to improve upward and downward communication simultaneously.

Smith, Mead, Wicks and Yewdall⁵³ examine the use of graphs, charts, diagrams and pictograms as communication media. Statistical graphs can be used to depict quantitative relationships while mathematical graphs can be used to depict relationships between variables. These could for instance assist sales staff in understanding the relationship between critical factors and the sales which they are trying to predict. Diagrams can be used to explain points being made, while pictograms may be useful for dramatising simple messages, possibly for shop-floor personnel. The advantages of these techniques are that they communicate quickly, are more dynamic and revealing, easier to remember and allow personnel to interpret the message themselves. The disability which they suffer is the cost and time involved in their production; however this is simple a question of the accountant balancing the costs against the benefits which he predicts will accrue from them in the form of budget feedback. Of course the balancing process is necessarily a subjective one. Odom⁵⁴ reports that in his company, discussions with supervisors in relation to cost centres were assisted by Polaroid photographs taken of the area when operating. Bulletin boards were used to communicate matters about which personnel indicated they wished to be informed. One danger in the use of bulletin boards, ignored by Odom, is that if

⁵²Dann H. Fenn Jr. and Daniel Yankelovich, 'Responding to the Employee Voice', *Harvard Business Review*, May-June 1972.

⁵³C. W. Smith, G. P. Mead, C. T. Wicks and G. A. Yewdall, op. cit.

⁵⁴G. T. Odom, op. cit.

⁵⁰R. I. Tricker, op. cit., p. 123.

⁵¹Herbert A. Simon, op. cit., pp. 154-171.

material is left on them too long, personnel lose interest and cease to look at the board, so that when new information is displayed, they may not study it. One rather novel remedy has been successfully tried in a company in Adelaide, South Australia where bulletins have been posted on the inside of toilet cubicle doors where fairly inevitably they are indeed read by personnel. This experiment evoked considerable favourable comment from personnel in that company. The accountant might find it an effective (and certainly novel) way of reaching shop-floor employees.

To encourage budget system communications the accountant has at his disposal a wide variety of communication techniques which can improve his own communications to personnel and encourage and improve their communications to him and operating personnel involved in budget planning. Nevertheless it is essential that he goes at least some way towards establishing an open, receptive and supportive climate in which communications may take place. If an atmosphere of mistrust exists between personnel in the company, then his innovations in communication techniques will run the risk of being in vain. The encouragement of a supportive atmosphere can simply be commenced by the accountant acting and communicating in a positive and sympathetic manner himself. He should ensure that he is not simply judged by the representations of others or his own written communications but by his own personal contact with personnel at all levels of the enterprise hierarchy. With this in mind it would appear that no programme of improved communications can be completely effective without the accountant at least attempting to take a greater part in using and improving the informal communication network himself.

Conclusion

Accountants' employment of basic communication skills are of critical importance for any attempts to increase the reciprocal flow of information between parties involved in the corporate budgetary system.

As a first step, accountants ought to review their own methods of communicating to other corporate personnel both on a formal and informal basis. If they do not become effective communicators themselves, then they cannot expect to improve the communication of other line and staff personnel who find themselves involved in the budgeting process. It is surely not a responsibility which accountants can sidestep in view of their entrenchment in the tasks of information gathering, recording, analysing and disseminating. Therefore they should develop an awareness of the types of communication channels existing in their company, the patterns of the networks in which they are a link, the factors affecting meanings perceived in messages by recipients and the influences over direction, speed and volume of information flow in the budgetary system. The task inevitably becomes one of balancing various and competing constraints such as organisation structure, industry technology, trade union attitudes and human characteristics.

Once this broader perspective of budgetary communication requirements has been established, then accountants can proceed to evaluate the range of practical methods available for initiating budget related discussions, reports etc. These vary from face-to-face conversations to group meetings, from memoranda to display charts, from listening techniques to writing styles, from telephone calls to bulletin boards and so on. These possibilities in turn require considerations of the level of employee involvement in budget setting and reviewing and indeed more imaginative use of communication media may allow budget related information to reach lower levels of the organisation hierarchy than previously thought possible. This in itself could provide the possibility of a greater flow of budget information emanating from the shop floor. What accountants should therefore recognise is that what appear to be very basic principles of communicating skills eventually lead to expanded possibilities for company-wide contributions to budget planning and review.

Current Cost Accounting as a Surrogate for Dividend Paying Ability

J. Timothy Sale and Robert W. Scapens

In the UK, discussions of profit measures have advanced further than historical-cost-based measures. At the present time, serious consideration is being given to the implementation of current cost profit recommended by the Inflation Accounting (Sandilands) Committee.¹ In their report, the Sandilands Committee stressed the importance to shareholders of information about the distributable operating flows (DOF) generated by their company. The Committee stated:

an accounting system can . . . ensure that the profit figure reported is such that, if the profit for the year were fully distributed, it would not prejudice the ability of the company to continue to generate the same profit in future years if revenues earned and costs incurred in future years were the same as in the year of account.²

It may be noted that DOF does not purport to measure the amount that should or will be distributed. The dividend decisions will be based on opportunities available for reinvestment or the need for disinvestment and the company's and/or statutory dividend policy, as well as the flows which are currently available. DOF indicates the level of dividend which could be maintained into the indefinite future if the business continues with its current level of operations and if the environmental factors remained unchanged. Obviously, this latter condition is unlikely to hold. Nonetheless, if this limitation is understood DOF could provide a measure of dividend paying ability which may be useful to existing and potential shareholders (and possibly to other users of financial statements). When formulating expectations of future dividends an

individual could use dividend paying ability (as measured by DOF) as a base to be modified by the effects of expected environmental changes, anticipated growth or decline of the business and any dividend policy restrictions. However, an examination of the information needs of financial statement users is not an objective of this paper. The conclusion of the Sandilands Committee that information about DOF will be useful to investors is accepted.

The purpose of this paper is to explore the validity of the current cost profit measure proposed by the Sandilands Committee (and endorsed in ED18 and the Hyde Guidelines) as an indicator of dividend paying ability. To accomplish this object, a mathematical model of the Sandilands Committee's proposals will be developed and compared with a criterion DOF model. A model incorporating general price level adjustments will also be developed and compared with the DOF model. These evaluations will provide some insights into the properties of current cost profit as a measure of the DOF data which the Sandilands Committee considered useful for investors and will allow us to make some observations about the content of ED18 and the Hyde Guidelines. However, as the Hyde Guidelines are expressed in very general terms it will be necessary to relate specific issues to the proposals of the Sandilands Committee and ED18.

Criterion DOF model

Distributable operating flows (DOF) indicate the maximum funds generated by operations that can be distributed to owners without lowering the level of future operations. Operating flows can be defined as the change in working capital arising from normal operations, where working capital is measured by current assets less current liabilities. Accordingly, operating flows will be increased by revenues and reduced by those expenses requiring the use of current working capital. In this paper, depreciation will be assumed to be the only operating expense not requiring the use of working capital.

¹See the *Report of the Inflation Accounting Committee*, F. E. P. Sandilands, chairman (The Sandilands Committee) Cmnd. 6225 London: HMSO (1975); The Accounting Standards Committee, *Exposure Draft 18*, Current Cost Accounting (30 November 1976) and The Accounting Standards Committee, *Inflation Accounting - an interim recommendation* (The Hyde Guidelines) (4 November 1977).

²*Report of the Inflation Committee*, para. 166.

A model of DOF is developed below in the following terms:

- R_t = operating funds flow before inventory replacement in period t
- C_t = funds flow required in period t to maintain exactly physical inventory (or replace items sold) as the sales take place
- A_t = replacement cost of a fixed asset pool available at the end of period t to duplicate exactly the original productive capacities of the firm's actual fixed asset pool on hand at that date
- α = proportion of fixed assets which must be replaced each period to maintain exactly productive capacity. This proportion is assumed to be constant from period to period.

The DOF in any period t , represented by D_t , may be expressed as follows:

$$D_t = R_t - C_t - \alpha A_t \quad (1)$$

It is assumed that there is no growth in the firm's physical operations, nor any increase in its physical assets including inventories. The total DOF is distributed as a dividend to the owners at the end of each period.

All prices are assumed to change at a steady rate from period to period and also within each period. The constant periodic growth in the general price level will be represented by p , and the term r will be used to represent the constant periodic growth rate in C_t (i.e., the price of inventory purchases). This implies that the prices paid for inventory replacement at the end of a period will be $(1+r)$ greater than the prices paid at the start of the period, whereas the general price level will be $(1+p)$ greater. The steady increase within each period implies that at the mid-point of the period inventory prices will be $(1+r)^{\frac{1}{2}}$ greater than at the start, with the general price level $(1+p)^{\frac{1}{2}}$ greater. The prices at other dates within each period may be computed likewise.

The above assumptions appear very restrictive. They are used in this paper because they simplify the analysis and ease presentation without any fundamental effect on the conclusions which are reached. Some comments are made later about the likely change in the analysis which would be brought about by a relaxation of these assumptions.

Equation 1 will be used as the DOF criterion model for the evaluation of current cost measures of profit. The next step is the development of a model for current cost profit.

A current cost model

The Sandilands Committee recommends a calculation of current cost profit that comprises two revisions

to the conventional historical cost profit and loss account: (i) a cost of sales adjustment, and (ii) a revised depreciation calculation. The purpose of the cost of sales adjustment is to revise the historical cost of sales figure to a current cost basis. The revised depreciation charge is computed by applying a depreciation rate (which measures the productive capacity used up each period) to the current cost of fixed assets at the end of the period. In most cases the replacement cost of fixed assets at the end of the period, A_t , will be appropriate for this depreciation calculation. ED18, however, recommended a calculation of depreciation in terms of the average-of-the-period current cost, but with an additional adjustment for 'current-year backlog depreciation'. The total of these two elements of depreciation is equivalent to the depreciation charge recommended by the Sandilands Committee. The ED18 calculations are discussed later. The Hyde Guidelines refer to a charge for current cost depreciation without reference to either end-of-period or average-of-the-period current costs.

For the profit and loss account, the Sandilands Committee recommends a measure of current operating profit which excludes holding gains. The current operating profit in period t will be increased by the funds flow from operations before inventory replacement, R_t , and decreased by the historical cost of sales, G_t , adjusted by a cost of sales adjustment, Adj_t , and further reduced by depreciation charges, αA_t . With these new variables current operating profit in period t , COP_t , can be expressed as follows:

$$COP_t = R_t - (G_t + Adj_t) - \alpha A_t \quad (2)$$

While historical cost is the basis for determining G_t , various methods or cost flow assumptions can be used to derive historical cost. The Sandilands Committee pointed out that the FIFO convention is widely used in the UK³ and they framed their proposals accordingly. In this paper, the historical cost of sales will be based on the FIFO convention.

Cost of Sales

For comparison of the COP and DOF models, G_t and Adj_t in equation 2 will be expressed in terms of C_t . But, first, some assumptions must be made about inventory turnover. It will be assumed that:

- (a) the inventory holding period is less than one accounting period,
- (b) inventory at any point of time has been acquired evenly throughout the previous holding period, and,
- (c) the inventory holding period is $2h$, where h is expressed as a fraction of an accounting period.

³Ibid., para. 584.

TABLE 1

Price Level Index Numbers

	(start of period t as base = 1) Prices of Inventories	General Price Level
When opening inventory for period t was acquired (a period of length h prior to start of period t)	$(1+r)^{-h}$	$(1+p)^{-h}$
Start of period t	1	1
Mid-point of period t	$(1+r)^{\frac{1}{2}}$	$(1+p)^{\frac{1}{2}}$
When ending inventory for period t was acquired (a period of length h prior to end of period t)	$(1+r)^{(1-h)}$	$(1+p)^{(1-h)}$
End of period t	$(1+r)$	$(1+p)$

It follows that the inventory held at any date will have been acquired, on average, half the holding period previously (i.e., a period of length h previously). An additional assumption of no growth in physical inventory was made earlier. These assumptions are convenient for the analysis, but some are quite restrictive. The effects of relaxing them are discussed later.

With these assumptions about the inventory, the historical cost of sales, G_t , can be expressed in terms of period t fund flow for inventory replacement, C_t , as follows:

$$G_t = J_{t-1} + C_t - J_t \quad (3)$$

where J_{t-1} = carrying value of beginning inventory

J_t = carrying value of ending inventory, and,

C_t = purchases during period (as well as net funds outflow for inventory replacement)

As stated earlier, the inventory is costed on a FIFO basis. Accordingly, the ending inventory will be costed in terms of the prices prevailing during the preceding holding period, or, on average, at the prices prevailing at the period h prior to the end of the accounting period. The prices prevailing at that date will have been $(1+r)^{(1-h)}$ greater than the prices at the start of the period. As there is no change in physical inventory, the opening inventory will have been acquired exactly one period earlier. During the intervening period inventory prices increased at the rate of r . Thus, the prices used for costing the opening inventory will have been, on average, $\frac{(1+r)^{(1-h)}}{(1+r)} = (1+r)^{-h}$ times the prices at the start of the current accounting period. These price levels are set out in Table 1 in the form of index numbers, with the prices at the start of period t as the base = 1.

If I_t is defined as the cost of replacing the physical inventory at the end of period t , it follows that:

$$I_t = J_t (1+r)^h \quad (4)$$

and

$$I_{t-1} = J_{t-1} (1+r)^h \quad (5)$$

Equations 4 and 5 reflect the application of index number adjustments to restate the original cost of closing and opening inventories in terms of the prices prevailing at the end and beginning of the period. Also, in line with previous assumptions:

$$I_t = I_{t-1} (1+r) \quad (6)$$

Equations 4, 5 and 6 can now be used to express the opening and closing inventories in terms of I_t .

$$J_t = I_t (1+r)^{-h} \quad (7)$$

and

$$J_{t-1} = I_t (1+r)^{-(1+h)} \quad (8)$$

These expressions can now be substituted into equation 3, as follows:

$$G_t = I_t(1+r)^{-(1+h)} + C_t - I_t(1+r)^{-h}$$

which simplifies to:

$$G_t = C_t - I_t r (1+r)^{-(1+h)} \quad (9)$$

This equation indicates that the FIFO historical cost of sales will be less than the funds flow required to exactly maintain the physical inventory by the item $I_t r (1+r)^{-(1+h)}$. This term will be positive when $r > 0$ (i.e. when prices are rising), and accordingly in those circumstances the historical cost of sales will be insufficient in the long run to maintain the existing level of operations.

Cost of Sales Adjustment

The Sandilands Committee recognised the shortfall in the historical cost of sales in a period of rising prices and proposed a cost of sales adjustment to restate the cost of sales in terms of the period's current costs. They recommend calculating the cost

TABLE 2

Cost of Sales Adjustment

(i) Closing inventory	$J_t \frac{(1+r)^{\frac{1}{2}}}{(1+r)} = J_t(1+r)^{-\frac{1}{2}}$
(ii) Opening inventory	$J_{t-1} \frac{(1+r)^{\frac{1}{2}}}{1} = J_{t-1}(1+r)^{\frac{1}{2}}$
(iii) Stock movements:	
Unadjusted	$J_t - J_{t-1}$
Adjusted	$J_t(1+r)^{-\frac{1}{2}} - J_{t-1}(1+r)^{\frac{1}{2}}$
(iv) Cost of sales adjustment	$Itr(1+r)^{-(1+h)}$

of sales adjustment by a method known as the 'averaging method',⁴ outlined below.

(i) The closing book value of stock in the balance sheet is multiplied by the average price of stocks held during the year and divided by the average price of stock held at the end of the year.

(ii) The opening book value of stocks in the balance sheet is multiplied by the average price of stocks held during the year and divided by the average price of stocks held at the beginning of the year.

(iii) The difference between the opening and closing valuation of stock on an 'adjusted' basis (i.e., after carrying out the calculations at (i) and (ii) above) is then subtracted from the difference on an 'unadjusted' basis (i.e., the balance sheet figures).

(iv) The result of the calculation at (iii) above is the 'cost of sales adjustment'.⁵

The cost of sales adjustment for period t , Adj_t , is computed in Table 2 by following the steps outlined above. Step (iv), the cost of sales adjustment, will initially be expressed as:

$$Adj_t = J_t - J_{t-1} - [J_t(1+r)^{-\frac{1}{2}} - J_{t-1}(1+r)^{\frac{1}{2}}] \quad (10)$$

Substituting equation 7 and 8, and simplifying it follows that:

$$Adj_t = I_t r(1+r)^{-(1+h)} \quad (11)$$

Equation 11 measures the cost of sales adjustment recommended by the Sandilands Committee and illustrated in the Hyde Guidelines. However, the adjustments of opening and closing inventories in Table 2 imply an assumption about the carrying value of those inventories. The assumption, which

was made explicit by the Committee,⁶ is that a FIFO inventory costing is a reasonable approximation of the inventory's end-of-period current cost. The inventory adjustments in Table 2 restate the inventory carrying value in terms of the mid-period (or average-of-the-period) current costs; hence the numerator of $(1+r)^{\frac{1}{2}}$. As the denominators in the adjustment are $(1+r)$ and 1 for closing and opening inventory respectively, J_t and J_{t-1} are assumed to be valued at the prices prevailing when the index numbers stood at $(1+r)$ and 1 respectively (i.e. the end and beginning of the period). In other words, it is implicitly assumed that $J_t = I_t$ and $J_{t-1} = I_{t-1}$. Equations 4 and 5 indicate that this condition does not hold unless either $r=0$ or $h=0$.

Table 3 shows the revised calculation of the cost of sales adjustment, without the above assumption. The Sandilands Committee suggested that such a revision might be introduced into current cost accounting after the initial applications of the system. In this revised adjustment the denominators reflect the inventory prices at the dates on which J_t and J_{t-1} were, on average, acquired. The revised cost of sales adjustment, Adj_t^* , is as follows:

$$Adj_t^* = J_t - J_{t-1} - [J_t(1+r)^{-\frac{1}{2}+h} - J_{t-1}(1+r)^{\frac{1}{2}+h}] \quad (12)$$

Now, substituting with equations 7 and 8 and simplifying, it follows that:

$$Adj_t^* = I_t r(1+r)^{-(1+h)} \quad (13)$$

This revised cost of sales adjustment is identical to the cost of sales adjustment shown in equation 11. The reason for this is the assumptions of a constant inventory holding period, a constant periodic growth in inventory prices and no growth in the physical inventory. As a result of these assumptions the

⁴Ibid., para. 596.

⁵Ibid., para. 597.

⁶Ibid., para. 603.

TABLE 3

Revised Cost of Sales Adjustment

(i) Closing inventory	$J_t \frac{(1+r)^{\frac{1}{2}}}{(1+r)^{1-h}} = J_t (1+r)^{-\frac{1}{2}+h}$
(ii) Opening inventory	$J_{t-1} \frac{(1+r)^{\frac{1}{2}}}{(1+r)^{-h}} = J_{t-1} (1+r)^{\frac{1}{2}+h}$
(iii) Stock movements:	
Unadjusted	$J_t - J_{t-1}$
Adjusted	$J_t (1+r)^{-\frac{1}{2}+h} - J_{t-1} (1+r)^{\frac{1}{2}+h}$
(iv) Cost of sales adjustment	$h r (1+r)^{-(1+h)}$

amounts of opening and closing inventories are identical when valued at average-of-the-period prices. Accordingly, the adjusted movement in inventories is zero in both Tables 2 and 3. If a consistent inventory policy is followed (involving both a constant holding period and a stable physical inventory) and inventory prices are growing steadily, the assumption recommended by the Sandilands Committee (i.e., FIFO inventory may be considered to be an approximation of current cost inventory) will have no effect on the cost of sales adjustment. However, if inventory policy changes or inventory prices fluctuate the assumption will lead to a different cost of sales adjustment. In such a case, it would be desirable to use the revised cost of sales adjustment (Adj*), as this will more accurately compute the stock movement during the period in terms of average current costs.

EDr8 suggested that companies should wherever possible measure cost of sales directly in terms of the current cost at the date of sale. Such an approach would give a measure of C_t , without the need for a cost of sales adjustment. However, where a company's accounting system will not provide this information a cost of sales adjustment (equivalent to Adj*) can be used. Accordingly, in this area EDr8 represented an improvement over the initial recommendations of the Sandilands Committee.

Current Operating Profit

The measure of current operating profit expressed in equation 2 can now be rewritten using equations 9 and 13 as follows:

$$COP_t = R_t - [C_t - I_t r (1+r)^{-(1+h)} + I_{t-1} r (1+r)^{-(1+h)}] - \alpha A_t$$

which simplifies to:

$$COP_t = R_t - C_t - \alpha A_t \quad (14)$$

Equation 14 may be compared to the criterion DOF model in equation 1. It will be observed that the

Sandilands Committee's measure of current operating profit (as developed in this paper) provides an exact measure of distributable operating flows. However, a number of assumptions were made to simplify the analysis. Some comments about these assumptions are now appropriate.

It was assumed earlier that the price of purchases for inventory grows steadily. If this assumption does not hold and prices change at different rates from period to period the Sandilands Committee's approximation for the cost of sales adjustment (which was accepted by Hyde) will affect the similarity of DOF and COP. It may be expected that where the rate of price increase in period t , r_t , exceeds the rate of increase in the previous period, r_{t-1} , COP will be less than DOF if the approximation is used. This is because the cost of sales adjustment in that case would be computed by adjusting the opening and closing inventory for the price change in period t , r_t . However, to revalue opening inventory at average-of-the-period current cost the adjustment should reflect r_{t-1} for the holding period prior to the start of period t , and r_t for holding periods within period t . Accordingly, the approximation will overstate the cost of sales adjustment and understate COP. But, as the Sandilands Committee pointed out, this understatement may not be material. The revised cost of sales adjustment which is also set out in EDr8, will retain the similarity of COP and DOF when the rate of increase in inventory prices changes from period to period.

The effects of relaxing the assumptions about inventory growth and inventory holding period are similar. These two assumptions are interdependent. A change in the inventory holding period will normally be associated with some change in the physical quantity of inventory. However, such changes should not affect the comparability of DOF and COP, if DOF is interpreted as the funds which

are made available by existing operations and could be distributed (or used to finance the growth in inventories). The revised cost of sales of adjustment (Adj^*) gives a measure of COP which is consistent with this interpretation of DOF.

These comments suggest that a relaxation of assumptions will not fundamentally affect the usefulness of COP as a proxy for DOF – provided the revised cost of sales calculation, which was supported by ED18, is used.

To conclude this section, a comment is required about the depreciation calculation. The term A_t in DOF is equivalent to the revised depreciation charges recommended by the Sandilands Committee – i.e., depreciation computed at year-end current cost. ED18, however, would include depreciation in the profit and loss account at average-of-the-period current cost, with any difference between the depreciation charge and the provision required at the period-end (i.e., measured at period-end current cost) charged to revaluation reserve as the current year element of backlog depreciation. As a result the ED18 measure of COP will exceed DOF by the amount of this 'current-year backlog depreciation'. However, in many cases this difference will not be material – it will represent only a very minor component of the total backlog depreciation (which also includes the notional under provision for depreciation in earlier years).

Purchasing power adjustments

In an initial reaction to the Sandilands Report, the Consultative Committee of Accountancy Bodies (CCAB) welcomed the concept of current cost accounting, but indicated a preference for the inclusion of some explicit recognition of inflation in financial statements.⁷ ED18 went a little way towards meeting this suggestion with a note to the published financial statements setting out the effects of inflation on the ownership equity in the business. In this section of the paper consideration will be given to the effects of purchasing power adjustments on the usefulness of COP as a surrogate for DOF.

The CCAB did not illustrate the application of purchasing power adjustments, but they did suggest that an ideal would be financial statements prepared in terms of £s of current purchasing power. Accordingly, the measure of current operating profit examined below will be measured in terms of the purchasing power of money at the end of the accounting period.

As assumed earlier, and illustrated in Table 1, the general price level increases at a steady rate of p per period. In order to focus on operating activities, it is assumed that the firm has no long-term monetary assets or liabilities, and that at the start of each period short-term monetary assets equal short-term monetary liabilities. The periodic fund flow from operations is assumed to be distributed or used for fixed asset replacement at the end of each period.⁸

A price level adjusted measure of current cost operating profit, PLOP, will comprise elements similar to those in the associated money value measure. However, all elements of the profit calculation will be measured in terms of the period-end purchasing power.

$$PLOP_t = R_t^1 - (G_t^1 + Adj_t^*) - \alpha A_t - M_t \quad (15)$$

- where R_t = operating funds flows before inventory replacement in period t , R_t , measured in terms of period-end purchasing power.
- G_t = historical cost of sales, G_t , measured in terms of period-end purchasing power.
- Adj_t^* = the cost of sales adjustment required for $PLOP_t$.
- αA_t = current cost depreciation charges (as A_t is measured at the period end, no purchasing power adjustment is required).
- M_t = the loss from holding the monetary assets generated by operations.

There is much discussion about the appropriate treatment of gains and losses from holding monetary items. M_t is included in the PLOP model for the reasons discussed later.

R_t^1 is the monetary funds flow, R_t , restated in terms of period-end purchasing power. It was assumed earlier that operations were spread evenly over the year. Accordingly, R_t may be assumed to have been measured, on average, in terms of mid-period purchasing power. The restatement to period-end purchasing power can be expressed as follows:

$$R_t^1 = R_t(1+p)^{\frac{1}{2}} \quad (16)$$

⁸The purpose of these assumptions is to avoid complicating the analysis with calculations of the loss (or gain) from holding net monetary assets or liabilities. In the model, only the loss (or gain) resulting from the periods operations are considered. However, if the assumptions are relaxed the basic principles will be unaffected. It would then be necessary to compute the loss (or gain) from holding net monetary assets (or liabilities) through the period. See later discussion of the growth in monetary working capital.

⁷The Consultative Committee of Accountancy Bodies, 'Initial Reactions to the Report of the Inflation Accounting Committee', *Accountancy*, December 1975, pp. 92-96.

Cost of Sales

The price-level adjusted historical cost of sales will contain the elements in the historical cost of sales (equation 3) but measured in terms of period-end purchasing power:

$$G_t^1 = J_{t-1}^1 + C_t^1 - J_t^1$$

Each of the terms in the above equation represents a price-level restatement of the appropriate historical cost measure, viz.,

$$J_t^1 = J_t(1+p)^h$$

$$J_{t-1}^1 = J_{t-1}(1+p)^{(1+h)} \text{ and}$$

$$C_t^1 = C_t(1+p)^{\frac{1}{2}}$$

J_t^1 is computed by restating the historical cost of the ending inventory, which was acquired when the price level was $(1+p)^{1-h}$, in terms of period-end purchasing power (i.e., when the price level is $(1+p)$). The adjustments of J_{t-1} and C_t are comparable.

Now,

$$G_t^1 = J_{t-1}(1+p)^{(1+h)} + C_t(1+p)^{\frac{1}{2}} - J_t(1+p)^h$$

Equations 7 and 8 can be used to substitute for J_{t-1} and J_t in the above expression. Accordingly,

$$G_t^1 = I_t \frac{(1+p)^{(1+h)}}{(1+r)^{(1+h)}} + C_t(1+p)^{\frac{1}{2}} - I_t \frac{(1+p)^h}{(1+r)^h}$$

which may be simplified as follows:

$$G_t^1 = C_t(1+p)^{\frac{1}{2}} - I_t(r-p) \frac{(1+p)^h}{(1+r)^{(1+h)}} \quad (17)$$

This expression will be used later.

Cost of Sales Adjustment

The purpose of the cost of sales adjustment in the PLOP model is to restate the price-level adjusted

FIFO historical cost of sales at the average-of-the-period current costs expressed in terms of period-end purchasing power. The amount of the adjustment is computed by first adjusting the value of opening and closing inventory to average-of-the-period current cost (as shown in Table 3) and then restating this adjusted inventory in terms of period-end purchasing power. This calculation is illustrated in Table 4.

The cost of sales adjustment can be combined with the price-level adjusted historical cost of sales, equation 17:

$$G_t^1 + Adj_t^{*1} = C_t(1+p)^{\frac{1}{2}} \quad (18)$$

The above expression measures the current cost of sales in terms of period-end purchasing power. It may be observed that the price-level adjusted current cost of sales is simply the money value of the current cost of inventory replacement, C_t , restated in terms of period-end purchasing power.

Loss from Holding Monetary Assets

It was assumed above that no long-term monetary assets or liabilities are held by the firm and that at the start of each period short-term monetary assets equal short-term monetary liabilities. Accordingly, the only net monetary assets will be those generated by operations, which are assumed to be dispersed at the end of each period. The loss from holding monetary assets, M_t , will be incurred on those funds. In line with previous assumptions, the fund flow from operations may be deemed to have been received in the form of monetary assets (on average)

TABLE 4

Cost of Sales Adjustment (price level adjusted)

	Money Unit	Period-End Purchasing Power
(i) Closing inventory	$J_t(1+r)^{-\frac{1}{2}+h}$	$J_t(1+r)^{-\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}}$
(ii) Opening inventory	$J_{t-1}(1+r)^{\frac{1}{2}+h}$	$J_{t-1}(1+r)^{\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}}$
(iii) Stock movements: Unadjusted *	$J_t \frac{(1+p)}{(1+p)^{1-h}} - J_{t-1} \frac{(1+p)}{(1+p)^{-h}}$	$J_t \frac{(1+p)}{(1+p)^{1-h}} - J_{t-1} \frac{(1+p)}{(1+p)^{-h}}$
Adjusted	$J_t(1+r)^{-\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}} - J_{t-1}(1+r)^{\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}}$	$J_t(1+r)^{-\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}} - J_{t-1}(1+r)^{\frac{1}{2}+h} \frac{(1+p)}{(1+p)^{\frac{1}{2}}}$
(iv) Cost of sales adjustment	$I_t(r-p) \frac{(1+p)^h}{(1+r)^{(1+h)}}$	

*The unadjusted inventory is not adjusted for current costs. However, as purchasing power adjustments are included in the cost of sales calculation, the inventory has already been adjusted for purchasing power changes.

at the mid-point of the period.⁹ The loss from holding monetary assets will result from the change in the purchasing power of money from the mid-point to the end of the period.

$$M_t = (R_t - C_t) \frac{(1+p) - (1+p)^{\frac{1}{2}}}{(1+p)^{\frac{1}{2}}}$$

$$M_t = (R_t - C_t) [(1+p)^{\frac{1}{2}} - 1] \quad (19)$$

Price Level Adjusted Current Operating Profit

Equations 16, 18 and 19 can be used to re-express the elements in the PLOP model (equation 15) in terms of the variables used in the criterion DOF model.

$$PLOP_t = R_t(1+p)^{\frac{1}{2}} - C_t(1+p)^{\frac{1}{2}} - \alpha A_t$$

$$- (R_t - C_t) [(1+p)^{\frac{1}{2}} - 1]$$

$$PLOP_t = R_t - C_t - \alpha A_t \quad (20)$$

Equation 20 indicates that the PLOP model may also provide a good indicator of dividend paying ability. The inclusion of purchasing power adjustments in the model has not affected the nature of current cost profit as a surrogate for DOF. However, it is important to emphasise that the loss from holding the monetary assets generated by operations is included in the calculation of PLOP.¹⁰ This deduction is necessary because it is the money value of funds from operations which will be available for dividends. The purchasing power adjustments in the PLOP model restate the elements of the funds flow in terms of period end purchasing power. If the general price level is rising the restated amount of the net funds will not be available; only the actual monetary funds will be held at the period end and this is the amount available for fixed asset replacement and for dividends. Thus, the difference between the restated and money values of the funds flow from operations (M_t) should be included in the profit calculation if it is to lead to a measure of DOF.

Growth in monetary working capital

For purposes of the mathematical model used in this paper it was assumed that there was 'no growth in the firm's physical operations, nor any increase in its physical assets including inventories'. It was suggested that a change in physical inventory would not fundamentally affect the discussion. However, the effect of growth in monetary assets was not considered. It was assumed that 'the firm has no long-term monetary assets or liabilities, and that at the

start of each period short-term monetary assets equal short-term monetary liabilities'. This was convenient for purposes of presentation but some comments must now be made.

In a period when prices are rising and/or the business is expanding there may be a need for additional monetary assets - more debtors may be outstanding and a larger cash balance may be required. To the extent that this growth in monetary assets cannot be financed by an increase in short-term monetary liabilities, additional funds must be made available to service the existing level of activities. Where the increase in net monetary assets is necessary because of an expansion in operations, these additional funds should be provided out of the DOF generated by existing operations. However, if it is rising prices which has increased net monetary assets, the additional funds should be regarded as an expense incurred in generating DOF. Accordingly, the effect of rising prices on net monetary assets should be included as a deduction in the DOF calculation. To maintain the comparability of DOF and COP, such a deduction should also be included in the COP calculation (whether money value or purchasing power, i.e., PLOP, is used). A deduction of this nature was not envisaged in either the Sandilands Committee's report or ED18, although ED18 did suggest that directors may wish to set aside a reserve out of COP to maintain the substance of the business, which presumably would include net monetary assets. However, a report published in New Zealand by the Richardson Committee, which further developed the concepts of current cost accounting, did contain a proposal for a deduction in respect of circulating monetary assets.

The Richardson Committee proposed a general price-level adjustment for short-term monetary assets. This is probably a practical approach. However, the analysis adopted in this paper would suggest that any adjustment for monetary assets should reflect the firm's need to increase net monetary assets as a result of the changing prices. The amount required will be affected by the change in the firm's selling prices which will influence the extent of debtors outstanding, the prices of goods and services purchased by the firm which will affect the cash balance needed, and the extent to which additional finance can be obtained by increasing short-term monetary liabilities. Accordingly, the requirement for monetary assets will be influenced by factors particular to the business, and not by the movement in the general price level. This appears to be the view taken by the Hyde Committee. The Hyde Guidelines suggest that where a business has net monetary assets an additional adjustment should be calculated

⁹Alternative assumptions may be adopted. However, the assumptions must be consistent with the purchasing power adjustments used for fund flow from operations and for inventory replacement. Provided consistent assumptions are followed the results of the analysis will be unaffected.

¹⁰It may be noted that gains or losses on long-term monetary assets or liabilities will not fall into this category.

using an *appropriate index*, although this appropriate index is not defined.

In a situation where monetary liabilities exceed monetary assets it may be possible to raise sufficient additional funds (whilst maintaining the existing gearing ratio) to provide for all the inflationary expansion in monetary assets and to yield a surplus which will be available to finance part of the depreciation and cost of sales adjustments. The gearing adjustment in the Hyde Guidelines is one method of recognising that it may be possible to finance part of the current cost adjustments by net monetary liabilities. Such a gearing adjustment is essential to maintain the relationship between COP and DOF.

Conclusions

The mathematical models presented in this paper demonstrate that the proposals advanced by the Sandilands Committee do have the potential to provide a satisfactory method for reporting dividend paying ability. This conclusion confirms one of the claims the Committee made for current cost accounting. However, it was pointed out that the Sandilands' model does not provide for the change in monetary items which may result from price movements. In this respect the Hyde Guidelines represent a significant development of the Sandilands Committee's proposals. But in another respect the Guidelines are less helpful. They give no indication as to the particular current costs to be used in computing the depreciation charge. Should average-of-the-period or end-of-period current costs be used? It was pointed out above that '*current-year*

backlog depreciation' should be considered as an element of the current year's depreciation charge, whilst ED18 recommended that it should be charged against the revaluation surplus. In this respect, it is the original proposals of the Sandilands Committee which provide the best surrogate for DOF.

The Sandilands Committee's recommendation that inventory costed on a FIFO basis may be considered a reasonable approximation of current cost inventory for purposes of the cost of sales adjustment was shown to be acceptable, but only when a stable inventory policy is followed and there is little change in the rate of growth of inventory prices. If these conditions do not exist the approximation may not be appropriate.

It was also demonstrated that purchasing power adjustments can be added to the calculation of current cost profit without affecting the model's usefulness as a surrogate for DOF, provided that any purchasing power loss from holding the monetary assets generated by operations are deducted. Accordingly, the proposals of the CCAB would not reduce the usefulness of current cost profit as a surrogate for DOF, but neither will they add to the usefulness in this respect.

Finally, it should be noted that the models presented in this paper were based on several simplifying assumptions. However, it appears that a relaxation of some of the most restrictive would not fundamentally affect the analysis. Accordingly, it may be concluded that current cost accounting is potentially a useful measure of dividend paying ability, particularly when a recognition of the effects of price changes on net monetary assets is included in the profit calculation.

Statement of Accounting Theory and Theory Acceptance:

A Review Article by K. V. Peasnell

The American Accounting Association's charge to the Committee on Concepts and Standards for External Financial Reports was, in the words of the Committee's chairman, Lawrence Revsine, 'to write a statement that would provide the same type of survey and distillation of current thinking on accounting theory as *A Statement of Basic Accounting Theory* (ASOBAT) provided in an earlier decade'.¹

Committees of this sort can hardly be expected to break fresh ground; committees cannot efficiently conduct research, as SOATATA rightly points out (p. 49). A committee, particularly an academic committee, is bound to be dependent on the extant literature. As it is, we are told that during the two years it worked on the document the committee met but eight times as an entire group (p. ix); and this is hardly sufficient time to achieve breakthroughs of the consensus variety. Nor is novelty to be expected from documents of this sort, for much the same reason. And sure enough, the contents of SOATATA's sixty-one pages contains little on accounting theory that is new.

Nevertheless, the committee's report is an interesting contribution to the literature – not for what it says on accounting theory as such, but rather for its analysis of the reasons why the accounting community has been unable to make much progress in the development of a single universally accepted basic accounting theory. It is not that what the committee says on the matter is compellingly persuasive – to this reviewer it quite definitely is not. Rather it is the insights the committee afford us into the ways in which important groups of American accounting academics are thinking that is of interest. As the document's title indicates, this is a statement *about the process* of accounting theory formulation and theory acceptance, rather than a statement of accounting theory (as ASOBAT was).

This article provides an analysis and critique of the contents of SOATATA. Particular attention is paid to what the committee has to say on the prospects of developing theoretical frameworks capable of improving corporate disclosure practices in the United States, and the lessons this offers to accountants in Britain and other countries concerning the situation there.

The review consists of three parts. In the first, a summary and critique is presented of the committee's 'Kuhnian view' of the reasons behind the current difficulties in achieving consensus in accounting. Next, a description and evaluation is provided of the document's survey of contemporary approaches to accounting theory development. The article concludes with a short section on the insights SOATATA provides us of the preoccupations of American academic accountants at this moment in history.

Accounting – a scientific review

An important feature of the committee's analysis is that it looks at developments in accounting thought from a 'philosophy of science' perspective: the current state of accounting theory is evaluated from the standpoint afforded by Kuhn's theory² of how progress occurs in science. Whether or not Kuhn's ideas provide the most illuminating 'meta-theory'³ of how accounting theory development proceeds is a matter of some dispute. Let us therefore turn to the case that the committee puts forward for adopting this particular standpoint and the conclusions it causes the committee to reach. In order to do this, a brief overview of the chapters is called for.

A principal virtue of SOATATA is that the committee's views and the reasons for them are set out in a clear and easy to follow manner. This is

¹Committee on Concepts and Standards for External Financial Reports, *Statement on Accounting Theory and Theory Acceptance* (American Accounting Association, 1977), p. ix; hereinafter referred to as the 'committee' and 'SOATATA'. Page numbers given without further reference in the main text are from SOATATA.

²T. S. Kuhn, *The Structure of Scientific Revolutions* (2nd edn., University of Chicago Press, 1970).

³I am indebted to Professor Maurice Moonitz for this useful term to describe SOATATA's attempt to develop a 'theory of accounting theory development'.

obvious from the organisation of the chapters. Chapter One states the view of the committee that '... a single universally accepted basic accounting theory does not exist at this time. Instead, a multiplicity of theories has been – and continues to be – proposed' (p. 1). It is argued there that this is due to '... the existence of basic differences in the way various theories view users [of financial accounting reports] and the preparer-user environments' (p. 3).

Chapter Two is descriptive in character, as its title, 'Alternative Theory Approaches', indicates; it is primarily a scene-setter for the following chapter, which is charged with substantiating and developing the thesis set out in Chapter One. Nevertheless, Chapter Two is the largest of the five chapters, taking up twenty-six pages in all, amounting to fifty per cent of the whole document (bibliography excluded). Here the committee identifies three basic theoretical approaches, which it labels the *classical*, the *decision-usefulness*, and the *information economics* approaches, respectively; it is (I will argue) from this choice of classification scheme that many of the (what the committee claim to be) 'fundamental and starkly visible' differences suggest themselves.

In Chapter Three, the committee provides examples from the literature of the 'steady stream of counterarguments and criticisms [which] appears to have prevented any of the [alternative theory] approaches from gaining a clear majority of accounting theory students as supporters' (p. 31). These are: (i) the problem of relating theories to practice; (ii) 'the irresolvability of ... allocation-induced controversies' (p. 33); (iii) the potential suboptimality of normative standards; (iv) difficulties in interpreting security price-behaviour research, and the fact that this approach cannot be employed to assess the desirability of unreported alternatives; (v) the need to take account of cost-benefit considerations, coupled with the present inability to do so; (vi) limitations of data expansion.

Chapters Two and Three attempt to show that there is no sign of the available theoretical approaches yielding a sufficient and compelling basis for specifying the content of external financial reports. The purpose of Chapter Four is to develop a plausible explanation for the lack of progress in achieving accounting theory consensus.

It is the committee's view that the '... prevailing expectation among accountants that those efforts [of researchers, academic committees, and professionally sponsored policy groups] would lead to some sort of unified theory ...' (p. 41) is misplaced. The document '... suggest[s] that changes in the process of theorizing in accounting may be more revolutionary than evolutionary' (p. 42), and proceeds to analyse the

current state of play from the perspective of Kuhn's general view of scientific revolutions.⁴

Viewed from this perspective, the current state of affairs, with its variety of approaches, and the seemingly unending recycling of arguments and counterarguments in the literature as to issues deemed to be significant, the appeals to different sets of empirical phenomena and to different tests or standards for resolving these issues, suggests to the committee the existence of several competing paradigms. The old matching-attaching paradigm is under attack. According to Kuhn, in science dissatisfaction with existing paradigms is accompanied by theorists being able to take no common body of knowledge for granted and hence feeling forced to build the field anew from its foundation; this seems to the committee to be 'what is happening in accounting at the present time' (p. 43).

In such a situation, the road to achieving a consensus is likely to be an extremely arduous one. 'The proponents of competing paradigms almost inevitably find their argumentative discourse to be fraught with communication failures. That is, those who employ different paradigms find it difficult to communicate with one another. Numerous examples can be observed in accounting debates' (p. 44). Like Kuhn, the committee is unable to identify the factors that would lead to the growing acceptance of one paradigm and the resultant 'theoretical closure' of accounting.

SOATATA concludes with a final chapter, Chapter Five, devoted to highlighting the main points made earlier: that near-term closure of theory is not likely and in any case cannot be dictated by 'authoritative' bodies (or committees); that the institutional policy-making framework must now be regarded as being part of the realm of accounting theory; that until consensus paradigm acceptance occurs, the utility of accounting theories in aiding policy decisions can only be partial.

The committee's thesis is that what is happening in accounting at the present time is an example of the 'paradigm wars' (to coin a phrase) which have taken place in the natural sciences (after a certain stage of development has been reached) and is best understood in those terms. However, the arguments in support of this thesis are less than totally convincing, for two reasons. The first is that the variety of theory approaches described by the committee do not really constitute paradigms. This we shall turn to in the next section. A second, related, objection is that there seems to be good grounds for doubting the appropriateness to accounting of Kuhn's ideas on

⁴Op.cit.

the nature and character of scientific revolutions; interesting though they undoubtedly are, it may be that Kuhn's ideas do not travel well.

Almost everywhere one looks in the social sciences, so it seems, one encounters approving references to Kuhn's theories on the revolutionary nature of scientific change. In this context, I dimly recall an article appearing a few years ago in the *Times Higher Educational Supplement*, the author of which was reporting on his experiences as a graduate social science student in the United States; one tip offered to those contemplating doing graduate work there was to invest in a copy of Kuhn's book: to cite Kuhn in essays (for a variety of courses) was a sure-fire way of getting better marks. Anyone, then, who doubts the universal applicability of Kuhn's ideas, and wishes to convince other academics (particularly American academics) that they should treat Kuhn's ideas with caution, has an uphill task ahead of him. And, to this extent, it has to be recognised that the committee's reliance on Kuhn's views on the historical development of scientific knowledge seems likely to commend widespread acceptance.

Not being a philosopher of science, I am badly equipped to comment on the validity of Kuhn's analysis of *science*. Moreover, any reasonably prudent reviewer cannot help but be mindful of the fact that the committee numbered Robert Sterling among its members; and it is a matter of public record⁵ that Sterling favours a Kuhnian view of accounting development, as also it is that he has an earlier training in and considerable current knowledge of this area of philosophy. My own knowledge of the subject, on the other hand, extends little beyond the contents of Kuhn's book. What is more, I know little about science. But our concern is not with science as such; it is a question of the transmutation of ideas in the philosophy of science to accounting. On that there may perhaps be something I can say.

⁵See, for example, R. R. Sterling, 'A Statement of Basic Accounting Theory: A Review Article', *Journal of Accounting Research*, Spring 1967, p. 100, footnote 5. Sterling was, to my knowledge, the earliest writer to refer to Kuhn's book - although my colleague Professor Edward Stamp has pointed out to me that R. J. Chambers mentions Kuhn in a footnote on page 374 in the 'Epilogue' of his book, *Accounting, Evaluation and Economic Behavior* (Prentice-Hall, 1966), albeit that the reference is to an earlier work of Kuhn's, viz. *The Copernican Revolution* (Harvard University Press, 1957).

It should be pointed out that what the committee means by paradigms is somewhat at variance to Professor Wells' meaning; see M. C. Wells, 'A Revolution in Accounting Thought?' *Accounting Review*, July 1976. The following criticisms are intended to apply only to SOATATA's usage of the term; I find Wells' usage much more satisfactory, with its emphasis on the thought processes of practitioners and teachers rather than academic researchers.

I cannot avoid being struck by what seem to me to be obvious inconsistencies between Kuhn's and the committee's reasoning. Kuhn seems to be so fundamental to SOATATA's case, that this is worthy of further analysis.

The first point that is worthy of comment is that it seems to me that Kuhn's theory of the nature of scientific revolutions is intended to apply only to the sciences, whereas the committee is of the opinion that it can be extended to cover accounting as well. The committee, to be sure, is 'sensitive to the potential validity of criticisms that analyses (such as Kuhn's) of scientific practices and methodologies probably were not intended to apply and, in fact, may not be applicable to such diverse areas of intellectual activity as physical sciences, social sciences, and accounting' (p. 41). This is understating things, to put it mildly, for Kuhn himself went to great lengths to *restrict* the scope of this theory to certain disciplines; he is uncertain, for example, where to place (in terms of historical development, that is) the various social sciences in his scheme of things. Is the committee seriously suggesting that accounting has developed to the point where it is fruitful to consider it a science, when there remains doubt (according to Kuhn) that some other social science disciplines, such as psychology, have yet reached this stage of development?

On this point, the committee seems to be confused. For on the one hand SOATATA argues that 'An expanding array of accounting theories and/or theoretical approaches suggests the existence of several competing paradigms' (p. 48); and reference to the notion of paradigm implies, if Kuhn's analysis is accepted, that accounting has reached a state of development where it warrants treating as a 'science'. However, the committee's description of what is happening in accounting at the present time, viz. where '[m]any theorists seem to feel the need to . . . build the field of accounting anew' (p. 43), seems to fit more closely with Kuhn's description of the pre-science stage of development.

Here it is worthwhile noting Kuhn's views on debates of the 'is our subject a science?' nature. Accounting has had its fair share of these debates in recent times. So have many of the social sciences. According to Kuhn:

These debates have parallels in the pre-paradigm periods of fields that are today unhesitatingly labelled science . . . Often great energy is invested, great passion aroused, and the outsider is at a loss to know why . . . Probably questions like the following are really being asked: Why does my field fail to move ahead in the way that, say, physics does? What changes in technique or method

or ideology would enable it to do so? These are not, however, questions that could respond to an agreement on definition. Furthermore, if precedent from the natural sciences serves, they will cease to be a source of concern not when a definition is found, but when the groups that now doubt their own status achieve consensus about their past and present accomplishments^{6,7}.

The concern of the committee with accounting theory development and how its 'progress' can be speeded up seem to me to be more reminiscent of this pre-paradigmatic stage of development than with the paradigm conflicts of mature sciences.

As it is, the committee seems to be of the view that the present variety of accounting theory approaches is symptomatic of the paradigm conflicts of the mature sciences. But the existence of a variety of conflicting approaches does not allow us to treat them as different paradigms. Kuhn is careful not to equate lack of unity of method with paradigm conflict, for this state of affairs was also typical of the pre-paradigm periods of the natural sciences. More important, he takes care to point out in the 'Postscript' to the 1970 edition of his book that the sciences develop in quite different ways than do other disciplines:

This book, however, was intended also to make another sort of point, one that has been less clearly visible to many of its readers. Though scientific development may resemble that in other fields more closely than has often been supposed, it is also strikingly different . . .

Consider, for example, the reiterated emphasis, above, on the absence or, as I should now say, on the relative scarcity of competing schools in the developed sciences.⁸

The latter point in this quotation is especially important. For what Kuhn is saying here is that the hallmark of normal science is an *absence* of questioning of basics, not a marked tendency to ask such questions; a *paucity* of variety of fundamental approaches, rather than a *profusion* of them. The committee has done its job too well. It has convinced this reviewer that accounting is now characterised by a tendency to doubt existing methods, to start anew. If anything, though, this is surely a hallmark of an earlier stage of scientific development of the subject.

Further evidence could be called in support of the hypothesis that accounting is in a pre-scientific stage

of development. For example, the committee itself notes (p. 41) that the vast bulk of accountants fall victim to the charge of never having committed themselves to the principle of falsifiability. Adherence to the falsifiability principle is put forward by Popper to be *the* most noteworthy feature of the natural sciences⁹ and this, to my knowledge, has been almost universally accepted. What, then, can the committee have in mind when it states in the following breath: 'Nevertheless, we note striking similarities in the general objectives of science and accounting . . .' (p. 41)?

It seems to me that we can adopt one of (at least) two positions. We can accept that accounting is intended to be a scientific activity; in that case it would be helpful to decide if accounting (a) is in a pre-science, pre-paradigmatic stage of development or (b) is a fully developed science. Few, I think, would claim that the contemporary state of accounting warrants our treating it as a developed science; the committee has performed a useful task here in showing that there are too many competing viewpoints for anyone to be able to claim that accounting theory development is proceeding on 'normal' science lines.

Alternatively, we can treat accounting as a service activity. Unlike science, service activities are not ends in themselves; knowledge is acquired for pragmatic ends. This seems to be true of accounting.

It is, to my mind, a major mistake to treat accounting as a science. For to do so is only to run the risk of repeating the mistakes of the social sciences. Welfare economics, the 'policy' arm of economics, for example, has been concerned with putting 'what ought to be' (social choice) on a scientific foundation; but to no avail.¹⁰ Science is concerned with predicting and explaining the empirical world, the world that 'is'; and it is a basic philosophical proposition that 'ought' cannot be inferred from what 'is'.

Accounting is not a science, it is a service activity. Accounting therefore should be equated not with the sciences, but with fields like medicine, technology, and law, of which the principal *raison d'être* is an external social need. Sure, service professions *make*

⁹K. R. Popper, *The Logic of Scientific Discovery* (2nd edn., Hutchinson & Co., 1968).

¹⁰Since this assumption [of Pigou's that rich and poor men have similar tastes] involved inter-personal comparisons of utility, it was argued by Robbins that it was a non-scientific, ethical assumption because inter-personal comparisons of utility could not be made scientifically. . . . [A]t that time Robbins' arguments gave rise to a great deal of dismay . . . Economists did not seem to want to admit boldly that no application of economic theory to any practical problem was possible without presupposing some ethical premises or other'. S. K. Nath, *A Reappraisal of Welfare Economics* (Routledge & Kegan Paul, 1969), pp. 94-95.

⁶Kuhn, *op.cit.*, pp. 160-161.

⁷An interesting parallel to this kind of debate is that over 'Is internal auditing a profession?'. If the question has to be asked, then it isn't. See D. C. Burns and W. J. Haga, 'Much Ado About Professionalism: A Second Look at Accounting', *Accounting Review*, July 1977.

⁸Kuhn, *op.cit.*, p. 209.

use of scientific (i.e. empirical) knowledge – they often contribute to it – but their principal concern is with doing a particular job of work, fulfilling a social need.

The committee *almost* grasps this distinction when it notes:

Other plausible views [than a philosophical perspective of the history of science] are possible. One example of an alternative view arises from an economic interpretation . . .

From this economic perspective, disagreement ensues because we have heterogeneous opinions and tastes, and there is no neat, defensible method of putting our conflicting tastes and beliefs into a grand social function. Thus, the problem is by nature one of confrontation, and there is no generally accepted way of coming to agreement (p. 42).

However, the document goes on to say: 'So it is understandable that the current state of "theoretical" conflict in accounting exists and does not appear to be resolvable at the present time' (p. 42). This, unfortunately, completely misses the nature of the important distinction between science and technology, broadly construed.

For if the 'economic perspective' to which the committee refers, welfare economics, were to be applied to the theoretical disputes of *any* technology, then it is almost certain that *none* of those disputes would appear to be resolvable. If engineers, for example, were to subject all technical issues to this criterion of maximising social welfare, then no solutions would ensue because the requisite concept of social preference is just as missing in engineering as it is in accounting. Likewise with medicine and the law.

Service professions like medicine, technology, and law are generally content to go ahead and build their theories on less secure foundations. Doubtless medical, technological, and legal decisions are sub-optimal by some global standard; indeed, they are frequently taken to task for this. Doctors, engineers and lawyers prefer to set themselves more operational goals, such as 'getting patients well', 'meeting detailed performance specifications at minimum out-of-pocket costs', 'consistency with basic legal principles, statutes and case precedents'. Why cannot accountants be judged by similar, operational, service-oriented criteria?

All this, it has to be admitted, is of secondary importance to the question of the current state of accounting theory: for *if* the committee is correct in its view that a single universally accepted basic theoretical foundation does not exist at this moment in history, *then* our view as to the 'nature' of accounting (science v. technology) is likely to be important

in ascertaining suitable responses on the part of accounting researchers and policy-makers. But this presupposes that this *is* the current situation. To this issue we will turn in the next section.

Another way of looking at this is to ask ourselves the question: Do the variety of accounting theory approaches identified by the committee really constitute competing paradigms (or pre-paradigm 'schools of thought', for that matter)?

A paradigm, as I understand it, amounts to the frame of reference, or world-view, which the individual scientist brings to bear on his work. It is much more than a set of hypotheses or body of theory. It is the well from which the scientist draws his ideas, constructs his theories and devises his tests. It would seem, therefore, that there is little likelihood of an individual scientist accepting more than one *conflicting* (as contrasted with complementary) paradigm¹¹ at any one time. Thus, it would seem to be essential to the committee's view of things that there be little or no doubt as to which paradigm each major accounting theorist 'belongs'; nor indeed that there be serious doubts over the paradigm definitions. This the committee seeks to do in the second and third chapters of SOATATA.

SOATATA'S review of accounting theories

Consider the committee's descriptions of what it calls the 'classical' and the 'decision-use' approaches and the distinction drawn between them.

To illustrate the classical approaches to theory development the committee selected thirteen major writers on accounting during the period 1922 to 1975 and classified them into either what they call the 'normative deductive' (also 'true income') school or the 'inductive' school of thought. Those identified as members of the normative deductive school – the likes of Canning, Paton, Sweeney, MacNeal, Alexander, Edwards and Bell, Sprouse and Moonitz – are deemed by the committee to be primarily interested in making accounting policy recommendations; inductive theorists such as Hatfield, Gilman, Littleton and Ijiri, especially Ijiri, on the other hand, attempt '... to rationalize ... major elements of extant accounting practice' (p. 10).

¹¹In microeconomics, the behavioural and neoclassical theories of the firm can be viewed as complementary, rather than competing, paradigms in that they seem to serve quite different functions in economics, in the sense that an economist is not forced to choose between them; he can make use of one paradigm when dealing with one set of problems, and the other when he is concerned with different matters. See B. J. Loasby, 'Hypothesis and Paradigm in the Theory of the Firm', *Economic Journal*, December 1971.

The committee deems the key distinguishing characteristic of the decision-usefulness approach to be its '... explicit recognition of the usefulness objective' (p. 10). Again, two distinct strands or branches of thought are identified. 'In the first, decision *models* are stressed. Information relevant to a decision model or criterion is isolated and various accounting alternatives are compared to the data presumably necessary for implementing these decision models. In the second branch of the decision-usefulness approach, decision *makers* are the focus of attention. Their reactions to alternative accounting data are studied as a means of inductively deriving preferred reporting alternatives' (p. 10).

It should be noted that the distinction drawn between the classical and decision-use approaches is at odds with the distinction that has been made elsewhere in the literature between accounting works which are *a priori* and those which are empirical in nature.¹² For one complaint which has been levelled at those whom the committee refers to as 'normative-deductive theorists' is that their work relies entirely on logic; that is, their theories are not subject to any scientific test, there is no scientific 'confrontation' of theory with reality.¹³ Viewed from this perspective, one way of categorising authors is as to whether or not they are willing to submit their theories to empirical test.

For example, normative-deductive theorists could be divided into one group consisting of those willing to test the 'predictions' (profit measurements) of their theory against 'true income' (presumably discounted present value) calculated *ex post*, and another group composed of those opposed to such a test. In which case, it would not be too fanciful to treat some decision-usefulness approaches, e.g. Revsine's, as being nothing more than alternative ways of defining true income under uncertainty.

¹²See, for example, the proceedings of the conference on accounting research held at the University of Illinois at Urbana-Champaign, April 1971, published in N. Dopuch and L. Revsine, eds., *Accounting Research 1960-1970: A Critical Evaluation* (Center for International Education and Research in Accounting, University of Illinois, 1973).

¹³A far more damaging criticism is that all we have are hypotheses. The generation of hypotheses is useful, so the hypothesis-generator is far more productive than the man who merely retails what is provided by others or who serves as a carping critic. Nevertheless, we may ask whether too much energy has not been utilized to generate hypotheses and not enough to test hypotheses' (C. L. Nelson, 'A Priori Research in Accounting', in Dopuch and Gonedes, *ibid.*, p. 15). Incidentally, Nelson seems to take it for granted that all theorists would accept that decision-usefulness is the appropriate test criterion. But I am sure SOATATA is correct in implying that not *all* classical writers would do so; those who do the committee would place in the decision-usefulness camp.

Revsine, being the chairman of this committee, might object to such an alternative classification scheme, but this is beside the point. What is the point is this: the committee's classification seems to border at times on the artificial.

Indeed, the choice of theorists for inclusion in and exclusion from the 'classical' camp borders on the curious. For a start, Chambers is left out of the normative-deductive group altogether – the place I feel confident that most would locate him. And his inclusion in the decision-usefulness group is not unequivocal. To be sure, it is granted that his 1955 '... "Blueprint" article might well have served as the starting point for a decision-usefulness theory of financial accounting' (p. 12); but the committee goes on to point out that '... in his subsequent works Chambers apparently rejected the idea of basing an accounting theory on the decision models of specific user groups' (p. 12), likening his approach to MacNeal's and Canning's. Why then is Chambers not included with them under the classical approaches?

One answer is that to do so would tend to blur the distinction between the classical and decision-usefulness approaches integral to the picture they paint of paradigm conflict. To do so would be to say, in effect, that it is possible to 'belong' to more than one paradigm at the same time; and this surely will not do.

Other examples are not hard to find. For instance, the committee does not hesitate in placing Edwards and Bell as members of the normative-deductive classical school – yet Revsine points out in his book that '[t]he contention that current operating profit can be extrapolated in order to generate useful predictions originates with Edwards and Bell'.¹⁴ A good case can be made out therefore for treating Edwards and Bell as early members of the decision-usefulness school. A counter-case would be that the main concern of Edwards and Bell was with the provision of accounting information for the purpose of evaluating past decisions; but this stemmed from their view of the character of decision-making under uncertainty and so does not jeopardise the case for including them under the decision-use category.

Another example is R. Sterling's *Theory of the Measurement of Enterprise Income*¹⁵ which is not listed under the classical approaches and gets (as far as I can tell) only a passing mention (on page 17) when 'predictive ability' is being discussed; and yet it is generally viewed as being one of the major a

¹⁴L. Revsine, *Replacement Cost Accounting* (Prentice-Hall, 1973), p. 119.

¹⁵University Press of Kansas, 1970.

priori works of the past decade.¹⁶ Is it because Sterling, too, defies easy categorisation?

While on this subject, it is interesting to note that all the thirteen major 'classical' writers discussed in Chapter Two of SOATATA are Americans. Leaving aside for the moment the parochialism suggested by this, the most important point is that it implies an almost complete lack of development on the classical front during the period following Sprouse and Moonitz's monograph in 1962¹⁷ up to Ijiri's 1975 work¹⁸ (the last writer cited); and yet this is the very period when the decision-usefulness and information economics approaches were receiving considerable attention in the theoretical literature, and even in the profession itself. The Trueblood Report,¹⁹ after all, unequivocally comes down in favour of decision-usefulness being the ultimate criterion for determining the content of external reports. How, then, can the committee avoid drawing the one conclusion which its own logic points to, viz. that the 'classical paradigm' has been overthrown and is now of historical interest only?

As it is, this conclusion would not seem so compelling if other, more recent, studies had been included under the classical approaches. In particular, the hiatus in the literature between 1962 and 1975 could easily have been filled by non-American works; and it would have then become apparent that many of these recent writers do not fit neatly into the committee's boxes.

Wright, for example, is a normative-deductive theorist in the 'classical' mode, but in his influential 'Theory' article²⁰ he explicitly identifies the purpose of financial accounting as being to help investors in their share-trading decisions; similarly, his various attempts to provide a linear programming rationale to the Value to The Owner concept have a strong emphasis on decision-making, albeit in less precise terms²¹ than later decision-use theorists have

employed. Baxter,²² too, goes to considerable pains to emphasise the decision-making orientation of his undoubtedly classical-looking theories. And Chambers is another very eminent writer who, as we have already noted, does not unequivocally fit into either the classical or decision-usefulness schools. No mention is made of recent professional and governmental developments elsewhere in the English-speaking world either; yet both *The Corporate Report*²³ and Sandilands²⁴, for example, acknowledge the importance of decision-usefulness and rely on the normative-deductive classical literature without getting very bothered about the agonies of paradigm choice.

It is instructive to consider what SOATATA has in mind as the key distinguishing features of the classical and decision-usefulness approaches. As far as I can tell, the committee does not come out with a description of any *one* set of key unifying features of the classical approaches, so perhaps it is more helpful to state what it considers the current status of the decision model branch of the decision-usefulness approach to be (see pages 13 to 14 of the report);

- (1) Acknowledgement that the 'primary objective of accounting is to provide financial information about the economic affairs of an entity to interested parties for use in making decisions', including 'control' decisions.
- (2) To 'be useful in making decisions, financial information must possess several normative qualities', the primary one being 'relevance to the decision at hand'.
- (3) Selection of relevant attributes requires familiarity with user decision processes, and 'modelling' of these processes 'is often helpful to accounting theorists'.
- (4) The 'investment decision [to date, the only decision intensively analysed] models utilized by decision-usefulness theorists have been either simple present value models or two-parameter expected return and risk models'.
- (5) 'Investors' [postulated] desires to predict cash flows from the firm have led many decision-usefulness theorists to a [future] cash flow orientation'; whereas 'the impossibility of measuring a future event [has led others to] rule out the cash

¹⁶See 'Editor's Preface' in Dopuch and Revsine, op. cit., p. iv.

¹⁷R. T. Sprouse and M. Moonitz, *A Tentative Set of Broad Accounting Principles for Business Enterprises* (American Institute of Certified Public Accountants, 1962).

¹⁸Y. Ijiri, *Theory of Accounting Measurement*, Studies in Accounting Research No. 10 (American Accounting Association, 1975).

¹⁹American Institute of Certified Public Accountants, Study Group on the Objectives of Financial Statements, *Objectives of Financial Statements*, 1973.

²⁰F. K. Wright, 'A Theory of Financial Accounting', *Journal of Business Finance*, Autumn 1970.

²¹See, for example, F. K. Wright, 'Measuring Asset Services - A Linear Programming Approach', *Journal of Accounting Research*, Autumn 1968 and 'Dual Variables in Inventory Measurement', *Accounting Review*, January 1970.

²²See, for example, W. T. Baxter, 'Depreciating Assets: The Forward-looking Approach to Value', *Abacus*, December 1970; or W. T. Baxter and N. H. Carrier, 'Depreciation, Replacement Price, and Cost of Capital', *Journal of Accounting Research*, Autumn 1971.

²³Accounting Standards Steering Committee discussion paper, 1975.

²⁴Report of the Inflation Accounting Committee, *Inflation Accounting*, Cmnd 6225 (HMSO, 1975).

flow orientation', exit values being preferred instead.

I cannot help but feel that all this would have been quite acceptable to the likes of Alexander and Sir Ronald Edwards.

On the other hand, the committee is surely right to suggest that the decision-maker branch of the decision-usefulness approach is at odds with the classical approaches. The empirical domain has switched from accounting numbers to the actions of individuals; it is the behaviour of decision-makers which is the object of inquiry. This might well indeed be too much for many classically-trained accountants to swallow. Similarly, the committee's distinction between the decision-usefulness and information economics approaches is undoubtedly a useful one.

The answer to all this is easy to find. The three accounting theory approaches identified by the committee represent the dominant interests of key researchers at different stages in the development of accounting thought: the 'inductive' variant of the classical approach arose out of the early need to create logical order out of the observable differences in accounting practices; the 'normative deductive' sprang from the desire to 'improve' on the prevailing state of the art; the 'decision-usefulness' approach, in turn, stemmed from difficulties encountered in trying to deduce what is the 'most useful' alternative; and finally 'information economics' has been employed largely because of the criticisms levelled at the decision-usefulness criterion of a useful-to-whom and cost-benefit variety. Each time, the objects of *direct* interest – or in the committee's words (p. 47), the 'empirical domain' – has shifted. First, it was the accounting practices; then it moved to users' decision outcomes; and now to economy-wide costs and benefits. Put differently, the scope of accounting theory has steadily widened.

Nevertheless, this widening of scope is not without its attendant costs. For all its weaknesses, the normative-deductive approach can (and does) generate policy recommendations which are defensible in its own terms; whereas the decision-usefulness approaches are weak in this area at present, but will (almost certainly) increasingly generate policy recommendations as theory is built up and evidence accumulates. Information economics, on the other hand, is so abstract in character that usable (to be distinguished, of course, from definitive) results are a long way off; its present theoretical value is its power '... in isolating general relationships and effects of alternative scenarios' (p. 25). Whether, though, information economics will ever be able to deliver anything beyond this remains a moot point.

I could go on, but enough has been said to indicate that SOATATA provides an interesting and stimulating review of the literature. It is almost inevitable that such surveys will provoke controversy; this is one of their functions. As it is, there are many criticisms that could be made of the committee's treatment of various issues. For example, in discussing Arrow's Paradox, the committee makes the somewhat naive statement that Arrow's imposition of the Pareto-optimality condition 'hardly seems surprising' (p. 37). Similarly, no mention was made of the important point that studies based on the API metric are critically dependent on the implied assumption that equilibrium share prices can be 'explained' (i.e. represented) by the Capital Asset Pricing Model²⁵. But these are mere quibbles. The committee's review of the literature is an interesting one that will provide stimulating reading for all students of the subject.

Concluding comments

For non-Americans, SOATATA provides a useful source of data from which inferences can be drawn concerning the hopes and aspirations of American accounting academics, which in turn might aid in interpreting developments in their academic writings. (That the American accounting literature is of interest to non-Americans has been taken for granted throughout this article).

A striking feature of SOATATA is its concern with what it variously refers to as 'achieving accounting theory consensus' and 'theoretical closure'; these and similar phrases appear repeatedly throughout the document. This doubtless stems, at least in part, from the committee's charge, which was to prepare what might be called 'the child of ASOBAT'. But this is not the whole story, for the report does not attempt to identify the areas where there is common ground, as ASOBAT did. Thus, even the observation that '[t]here are a number of theorists who have become dissatisfied with the old matching-attaching approach' (p. 43), merely identifies a consensus of views on what it is that theorists are unhappy with, not on what they can accept. SOATATA catalogues areas where there is a *lack* of consensus. I have tried to show in the previous section that some of the

²⁵Basically, a nonzero API can be regarded as evidence against the Capital Asset Pricing Model (CAPM) rather than evidence of 'market reaction'. See J. A. Ohlson, 'On the Theory of Residual Analyses and Abnormal Performance Metrics', unpublished manuscript, School of Business, University of California at Berkeley, March 1977. Note as well that it has recently been demonstrated that the CAPM is untestable; see R. Roll, 'A Critique of the Asset Pricing Theory's Tests, Part I: On Past and Potential Testability of the Theory', *Journal of Financial Economics*, March 1977.

differences identified by the committee are more apparent than real.

This leads one to wonder why the committee should look so hard for differences and inconsistencies in contemporary theory. The high-powered membership of the committee might, I suppose, be partly to blame: Demski, Revsine, Staubus and Sterling are well-known for their advocacy of particular approaches; whereas a committee composed of lesser lights, having given fewer published hostages to fortune, as it were, might have found it easier to identify areas of agreement. As it is, it is not really surprising that this particular committee could only agree to differ; consequently, Kuhn's theory of paradigm conflict was almost bound to appeal.

The committee's repeated use of the phrase 'theoretical closure' is of significance in another respect as well: it implies that one of the central objectives of accounting should be to provide a basis for settling disclosure disputes, i.e., in the committee's words, to 'provide a basis for determining the content of external financial reports and resolving accounting controversies' (p. 1). Viewed from this angle, failure to 'achieve consensus' is to admit defeat, or at least a state of disequilibrium.

One reason for this might be the considerable pressures – e.g. Senate investigations, hostile treatment from the press, and auditors being sued for astronomical sums – that are bearing down on the public accounting profession in the United States. Bearing this in mind, and the large sums being spent by the Financial Accounting Standards Board on research, it is not surprising that theorists should see their task as being that of developing a settled foundation on which the profession can erect an unequivocally acceptable superstructure capable of determining the content of corporate financial reports. In this environment, it is only natural that accounting theorists should turn to science for lessons on how progress towards this end might best be made; it is

in the sciences that theory closure has been most frequently attained.

Whatever the reason, there is strong evidence of the attractiveness of a 'scientific solution' to accounting controversies, as witnessed by the frequently-expressed scorn for *a priori* research²⁶ and the swing (since the mid-1960s) to empiricism in the United States, whereas British and Australasian academics have continued to devote much of their intellectual resources to theorising.

The important message of SOATATA is that theoretical closure is not in sight; moreover, the committee points out that even in the sciences theoretical closure is fraught with difficulty. To this extent, SOATATA cautions against holding unreasonable expectations about what accounting theory can deliver. Theory closure is about the persuasiveness of arguments; and strictly speaking, persuasion is a matter of psychology, not scientific logic.²⁷

Promise is held out, though, of a better future. The committee states: 'This limited theory role will not necessarily persist in the long run, nor is it unique to accounting' (p. 51). The old American optimism reasserts itself.

Acknowledgement

Thanks are due to the participants of the Staff Seminars of the Universities of Kent and Lancaster, where embryonic versions of this paper were first presented. The article also benefited greatly from a number of long discussions with Frank Clarke of the University of Sydney and I am indebted to him.

²⁶Cf. note 13.

²⁷Little argues convincingly that any persuasive statement needs to be regarded as a value judgment; see I. M. D. Little, *A Critique of Welfare Economics* (2nd edn., Oxford University Press, 1957). The same must hold, therefore, for the views expressed in both SOATATA and this review article.

Book Reviews

Statements of Source and Application of Funds: A Practical Guide to SSAP 10. R. W. Knox. Institute of Chartered Accountants in England and Wales, 1977. 117 pp. £5.75

This useful book arose from its author's participation in courses about SSAP 10. Its primary aim is to explain the standard and expand on points of detail for those preparing and auditing published funds flow statements. Nevertheless, it does include useful criticisms and comments on future developments which, with its detailed worked examples, should make it suitable reading for students specialising in financial accounting.

The beginning of the book is its least convincing part. The author discusses the need for and usefulness of funds flow statements. There is a lengthy quotation from *The Corporate Report* which states with wild optimism that funds flow statements are 'likely to contribute significantly to user needs in:

- (a) Assessing the effectiveness of the entity in achieving objectives established previously . . . This includes, but is by no means limited to, compliance with stewardship obligations.
- (d) Estimating the future prospects of the entity, . . . and predicting future levels of production and employment.
- (e) Estimating the value of present or prospective interests in or claims on the entity.'

These remarkable claims are sensibly preceded by the caveat 'Insofar as past flow of funds can be an indicator for the future . . .'. However, caution is soon forgotten by the end of the unlikely series of uses for funds flow statements, of which the above quotation is an excerpt. Nowhere is there any explanation of how anyone, let alone the lay shareholder, might actually use a funds flow statement to estimate the value of prospective interests in the entity, and so on.

Later in the book there are several points which confirm this. For example, it is shown that alternative treatments for such items as extraordinary gains or tax can give quite different impressions of the position of the business. Also, there are examples of the use of alternative formats which lead to 'net liquid funds' or 'total financing' or 'working capital'. The possibi-

lity of these variations, and the book's discussion of the ways in which the statements may be manipulated make it clear, though not explicit, that a past flow of funds statement *cannot* sensibly be regarded as an indicator of the future. Liquidity ratios, current cost profit figures and other measures will be more useful for particular purposes. A helpful, but too brief, contribution to making it clear where the usefulness of funds flow statements lies is the discussion of the nature of 'funds'. However, there is no treatment of the separation of short-term from long-term funds, which seems important at this point.

The book continues with a good description of the worksheet method of preparing a funds flow statement from balance sheets. There is extra guidance on the treatment of minorities, repayment of loans and (substantially) on the treatment of losses, exchange differences and the sale of subsidiaries. In some cases, the detail is unnecessarily great for use in the preparation of published statements but may be useful for internal purposes.

There are also examples of specialised funds flow statements for financial institutions and property companies. In all these cases, there are worked examples, which cannot be said to be easy but are clear and detailed.

Near the end of the book there is a large worked example illustrating a bonus issue, the revaluation of property and the purchase of a minority interest. This involves deferred taxation, goodwill and other matters. Perhaps the author expects a little much from us if he thinks we will take in all this at once. After this, there is an erudite and informative discussion on the effects of inflation accounting on funds flow statements. This should prove useful in the future, and could perhaps have been dealt with at greater length.

The book concludes with a selection of recently published funds flow statements which are used to illustrate the alternative treatments mentioned earlier. There is also a reproduction of SSAP 10.

In general, this short book (about 40 pages of actual writing, omitting numerical illustrations) provides an intelligent description and analysis of funds flow statements. It contains sensible criticisms

of SSAP 10, although the opening discussion on the justification for and the appropriate uses of funds flow statements seems spurious and too brief.

University of Exeter

C. W. Nobes

Modern Credit Management. *P. R. A. Kirkman.* Allen and Unwin, for the Association of Certified Accountants, London 1977. 311 pp. £8.50.

It is a truism that in respect of the management of working capital we do not yet have so well developed and sophisticated a body of concept and precept as we enjoy (if that is the right word) in respect of the other half of financial management, i.e. the control of capital expenditure on fixed assets. What we do have is a collection of somewhat heterogeneous procedures relating to inventory management, cash budgeting and the control of trade credit. Each of those areas is usually considered in isolation from others: attempts at united, much less integrated, approaches are rare and as yet of a profoundly theoretical nature. Yet, the last half-decade of pronounced inflation has seen a significant shift of UK corporate fundings from fixed capital formation to investment in working capital. There are severe consequences for the growth of our national income; and thus a need for a less fragmented, more integrated theory and practice of working capital control. From this there follows a requirement for top-level managerial policies expressed as positive strategies, rather than as a belated confirmation of a series of middle-management reactions to perceived problems.

Mr. Kirkman is well aware of this shift in financial patterns, as his first chapter shows; and his text as a whole is a well argued plea for a considered trade credit policy and an explicit process of credit control. But nowhere is there any strong awareness of the place of credit control as part of a systematic approach to working capital management, whereby an integration of its separate parts might result in a whole which is greater than their mere sum. That there might well be, for example, a discernible synergy between inventory control and credit control is never considered. Their only apparent relationship is as major (but clearly separable) constituents of a cash budgeting process.

What we do have is a well-rounded discussion (albeit not in the following order) of issues relating to the organisation and staffing of a credit control function; the determination of a customer credit policy and conditions of sale, and of procedures to implement the policy effectively within those conditions; the measurement of the cost of credit control, and the setting up of the necessary accounting

processes; the establishing of credit references prior to a sale and the sequence of the subsequent collection processes (including court actions); and several other relevant matters necessary to the running of an efficient system of customer credit management. Mr. Kirkman is rightly concerned at the laxity or confusion in these matters which characterises many of our enterprises – it seems we British are distinctly less ‘hard-nosed’ in establishing and collecting our just dues than business folk in other parts of the world. He has several pertinent observations to make about the need for recognition of credit controllership as a very specific management skill, and about the wisdom of making that recognition concrete by organising and staffing the credit control department with the same care as any other senior administrative function. The need for a much clearer view of our terms of sales, and for the positive periodic reviewing of credit policy and credit control procedures, is made in a strongly persuasive argument: and the vexed issue of efficiency and expediency in collection routines and doubtful debt recovery is most usefully analysed and illustrated. Those who have not seriously considered debt factoring will find Mr. Kirkman’s reasonably brief exposé to be distinctly thought-provoking. His discussion of these various issues is temperate, and, within its selected confines, thorough. The analysis of the current situation in UK management of trade credit (based *inter alia* upon a comprehensive field study conducted in the latter part of 1975) and his derived conclusions are eminently fair and reasonable. His recommendations are informed by a keen awareness of the sensitive interface between customer relations, the selling function and credit control. Sometimes, indeed, one could have wished for rather less moderation and rather more of a positive attitude when discussing alternative solutions to some of these problems. The reader may disagree, but strong argument is an excellent stimulant to fresh thinking.

To any executive wishing to revise the present organisation or processes of credit management within his company, or to establish that function for the first time, this book is an invaluable reference – which is presumably the firmly ‘practical’ orientation the Association would be hoping for. Quite rightly, too: but it is a pity that the opportunity was not taken also to expose the reader to some of the newer, albeit as yet more conceptual approaches, if only briefly. After all, even DCF was regarded as pure theory by most practitioners, a short ten years ago (or less). And I can remember when contribution analysis was regarded as academic pretentiousness.

University of Warwick

R. A. Fawthrop

The Structure of Accounting Theory. S. C. Yu. University of Florida Press, 1976. vii + 319 pp. \$12.50.

Dr. Yu has embarked on a difficult venture, fraught with Odyssean dangers. The title of his book can be interpreted in more than one way. For one thing, 'accounting theory' may mean different things to different people, and it may mean different things in different contexts. So far as I can make out, it means here something like: theory as applied to the contemplation of phenomena observable in or applicable to what is generally called accounting (whatever 'accounting' may itself mean).

In his introductory chapter Dr. Yu states that the book 'is intended to present a methodological exposition of theory construction and verification in accounting. It does not deal with accounting theory per se. Our main purpose is to explore the nature and function of theory as a well-structured form of knowledge that is true, logically and/or empirically.' Hence, Dr. Yu is ostensibly concerned primarily with the way in which theories are constructed. As he goes on, 'the word "structure" signifies the relationships among the building blocks of a theory.' This might mean either that he intends to discuss presently existing accounting theory and show how it has been built, or that he wishes to discuss theory in general terms and then show how his findings can be applied to accounting, that is to show how accounting theory ought to be built. It is the latter course that he steers and this takes him into the waters not only of logic and scientific method but also of ethics and philosophy.

After the introductory chapter, he discusses the meaning of systematised learning, theory, and deduction and induction as methods of research. In Chapter 3 he examines 'the accounting discipline and its boundaries', while in Chapter 4 he discusses the nature of propositions and the formulation of concepts for application in accounting. Chapter 5 deals with 'normative and positive modes of accounting thought', with an appendix which takes the author into a twelve-page excursion to ethics and philosophy from the pre-Socratics to the critics of logical positivism.

Chapter 6 covers the meaning of measurement and some of the problems of measurement in accounting. In Chapter 7 systematic explanation is discussed in terms of the formation and testing of hypotheses. Chapter 8 provides, in the author's words, a 'tentative set of accounting postulates, not so much describing what accounting postulates are but rather demonstrating the significance of laying down the foundation upon which the discipline is to be built and developed.' An appendix to this chapter provides a chronological listing (rather than a

historical survey as the heading proclaims) of postulates that have been enunciated, from W. A. Paton's six in his *Accounting Theory* of 1922 to the four basic standards of the American Accounting Association's *A Statement of Basic Accounting Theory* in 1966. The final chapter 'attempts . . . to depict the essence of the accounting model, particularly the interplay of stocks and flows and the crucial relationships between general and special hypotheses of accounting.'

Dr. Yu stops short of providing a theory of his own. He lists a number of words and expressions which he calls 'hypotheses' but which are rather the names of concepts; he does not seem to have made clear – to this reader, at least – what each 'hypothesis' states. If he did so, of course, he would be outlining an accounting theory, which is what he seems to be expressly trying to avoid doing. In other words, while he does not propound a theory of accounting he provides a tentative set of twelve ideas on which to base the internal consistency of a logical theoretical structure. This is theory behind the theory; would it be unfair to describe it as etherealised theory?

Whether one agrees or disagrees with the utility of such an enterprise at this stage of development of accounting will no doubt depend upon one's previous thoughts and convictions; it is part of a current fashion to which many academic accountants seem to conform. Rather than discover something about actual phenomena of accounting they spend their talents on seeking out or avoiding pitfalls of logic and debating issues of accounting scholasticism. Whether a particular reader feels convinced by the author's evidence and arguments will most likely depend upon what he (the reader) already believes.

In pursuing his avowed objective, Dr. Yu is obliged to try to cover an immense area and his coverage is of necessity condensed and truncated in several directions. Hence it would not be surprising if some of the writers whose works he draws on may complain that full justice to their views has not been done. While one may sympathise with their complaint, one must also give credit to Dr. Yu for having even made the attempt at such an inclusive treatment.

At one point (p. 46), Dr. Yu states that 'the most one can say about accounting thinking at present is that it is in a state of chaos or confusion.' His work gives a wide-angle view of this state and discusses many of its contributing factors. No doubt his underlying aim is to reach a basis which will serve to bring some order into this region of disarray. He is, as it were, trying to clear the tangle of undergrowth so that a path through the jungle of confusion can be made. His path, when it becomes discernible, turns out to have several similar characteristics to

some of those of other explorers and to be going in much the same direction. Whether this is the right direction or whether it is leading to nowhere in particular may be a matter of opinion and speculation at present; it can hardly yet be considered a matter of fact.

The work is likely to be of interest mainly to accountants (chiefly academics, probably) who are interested in the prospect of developing a general theory from which all else in accounting – thought, practice, standards, rules – is to be logically derived. Even if this could be achieved, two major considerations would then have to be faced: first, that the world changes, and, second, that accounting cannot be a world unto itself.

Melbourne

L. Goldberg

The Anatomy of Accounting. A. D. Barton¹
University of Queensland Press, 2nd Edition, 1977.
xv + 593pp. £4.95.

This is the second edition of a book which was originally published in 1975. At that time it was favourably received in Australia, and as a result arrangements were made with Prentice-Hall International for a softback edition of the book to be made available in the UK and several other countries. The current UK softback price of £4.95 for a book of nearly 600 pages makes this edition very competitive, especially when it is compared with most introductory text-books of British and American origin.

The title of this book does not really provide an indication of the level of student at which the material is aimed. The author informs us, however, that the approach adopted has been successfully used in the past for teaching first-year undergraduates (both accounting and non-accounting majors) and MBA students. The author accepts that some lecturers may consider that the level of theory is rather advanced for an introductory course, although past experience has suggested that 'beginning students can handle the theory quite well'. The majority of UK accounting lecturers might prefer to leave the more detailed theoretical aspects until the second or even the third year of an accounting degree course, although there is no reason why this book should not be used for studies over more than one academic year. The latter point is largely accepted by the author in his preface to the second edition, as he now suggests that the additions made in the new edition make it 'suitable for use in advanced financial accounting courses wherein inflation accounting forms a major part of the course, as well as in introductory courses'.

We therefore have a book which is primarily intended for first year accounting courses, although a

significant amount of the material provided could be reserved for later study in accounting theory or financial accounting courses. The book in its revised form is split up into four parts: (1) Accounting and Economic Activity of the Firm (2) The Historic Cost Measurement System (3) Alternative Valuation Systems and (4) Analysis and Interpretation of Financial Reports. The first two sections of five chapters and fifteen chapters respectively would generally be regarded as introductory course material. There would probably be differences of opinion, however, as to how many of the five chapters (130 pages) contained in the Alternative Valuation section should be studied in an introductory course, although there is probably an increasing acceptance in universities and polytechnics that more of this material should be studied at an early stage. There are only two chapters in the final section which is really made up of a chapter on financial analysis and an overall summary of the author's views on financial accounting. In addition, there are four appendices, one of which contains solutions to the very useful problems that are included at the end of each chapter.

The first section of the book provides an excellent theoretical introduction to a study of accounting. At an early stage the author examines the relationship between accounting and related disciplines, e.g. economics, statistics, mathematics, organisation theory and law. This is particularly valuable as accounting students are often puzzled as to why they are studying so many 'non-accounting' subjects. The subject of financial information requirements is introduced at an early stage (chapter 3), and the needs of users are examined in detail, although the UK reader may be disappointed to see that there is no mention of *The Corporate Report*. Book-keeping is also introduced into this first section, although the traditionally trained accountant may be rather surprised to find the basic principles dealt with under the heading 'recording the economic activity of the firm'.

The second section provides over half of the chapters contained in the book, although the chapters are rather brief compared with those in the third section. The topics covered start off with the income statement and balance sheet followed by several chapters dealing with the preparation and adjustment of the final accounts. The book-keeping content is quite detailed, and this will please those accountants who consider that insufficient attention is devoted to this subject in university courses. I was rather surprised, however, to see the subject of 'cost of sales and inventory valuation' dealt with in only six pages (excluding problems). This probably reflects a feeling that cost accounting should not be dealt with in any

detail in a book of this nature. This matter will be returned to again later in this review.

Many of the topics examined in the latter part of the second section of the book have been the subject of recent exposure drafts and accounting standards. It was rather surprising, therefore, that a separate chapter was not devoted to this subject. It is naturally rather difficult to decide how this subject should be considered in a book that will probably be read in many English-speaking countries, but it is suggested that at the very least there should have been a more detailed examination of the desirability of accounting standards, and the subject areas in which standards have been issued. It would then have been relatively easy for the material provided on, say, inventory valuation, depreciation, and funds statements to be supplemented in the lecture room by an examination of the statements of standard accounting practice that have been issued by the local accountancy bodies on these subjects.

The third section is probably the strongest part of this book, which is not surprising as Professor Barton has produced numerous articles on various aspects of inflation accounting. I would therefore have very little hesitation in recommending all students of inflation accounting to read the five chapters contained in this section together with the last chapter in the book which provides an admirable summary of Professor Barton's overall views on this subject. Once again the reading matter will have to be supplemented by a study of the 'local' exposure drafts and statements, but this should not be a great problem provided the differences in terminology are properly appreciated.

Most accounting academics would accept that it is a difficult task to produce an introductory text book on accounting, as there are so many differences of opinion as to what should be contained in such a book. I am, therefore, rather reluctant to comment on possible omissions, as publishers will probably not be very keen to extend a book of this nature beyond 600 pages. I do feel, however, that it is desirable that first year students should study a small amount of elementary cost and management accounting material, and this viewpoint is now accepted at most UK universities. I am not sure as to how far this viewpoint is accepted in Australian universities, although even if there was a strong demand for the inclusion of this type of material, I do appreciate that publishers might object to the book being extended to, say, 650 or even 700 pages. Some of the very detailed appendix material might, however, be omitted. I would suggest that this is a matter which should be examined when the next edition is prepared, together with the observation

that I have made on accounting standards.

The comments that I have made in the last paragraph should not, however, be taken to imply that this is not a suitable introductory course book for accounting students. I feel that all lecturers who are responsible for first year accounting courses should carry out a very careful examination of this book. In the UK the current softback price is very attractive, and those lecturers who consider that their students should have a strong theoretical background in accounting will find it difficult to obtain a more satisfactory up-to-date book. At the very least, therefore, I think that this book should be on the 'recommended reading list' for all accounting degree courses, although I would be a little hesitant to make it a 'compulsory book purchase' for UK students in view of the omissions that have already been mentioned and the lack of material on domestic accounting standards and similar publications.

University of Exeter

P. R. A. Kirkman

Pioneers of a Profession. *Jas. C. Stewart.* Scottish Committee on Accounting History, 1977. xii + 181 pp. £6.50.

The initial purpose of this book was to examine the social background of the early Scottish Chartered Accountants. Subsequently the book was expanded to include an introductory section on the general growth of the accountancy profession. The time span of the biographical enquiry was limited to cover a twenty five year period commencing from the date of the granting of a Royal Charter in 1854 to the Society of Accountants in Edinburgh. It is from this Charter that the constitutional framework for the present Institute of Chartered Accountants in Scotland stems.

During the twenty five year review period, the Glasgow Institute was formed in 1855, and the Society of Accountants in Aberdeen was later established in 1867, and it is from these three institutions that the list of the pioneers of the Scottish Accountancy profession has been compiled.

Mr. Stewart states in his preface: 'I have tried to bring together such biographical notes about the first Chartered Accountants as could fairly easily be assembled without undertaking research on a scale for which I have neither the skill nor the temperament'. Despite this disclaimer a great many facts have been given about many of the three hundred and forty six men listed, details which must have taken a great deal of time and effort to compile. It is thus a great pity that only general references are given at the front of the text, and detailed source

references have been omitted. The biographical notes do however clearly illustrate the social background of the early Chartered Accountants. As would be expected strong links can be seen with the legal, ecclesiastical and banking fraternities. Of rather more interest, is the observation (on page 11) that a number of Edinburgh Chartered Accountants had close links with insurance companies. In fact five of the first fourteen Presidents of the Edinburgh Society were Fellows of the Faculty of Actuaries; whereas the accountants in Glasgow appear to have had a much closer link with the Glasgow Stock Exchange Association. Twelve of the first sixteen Chairmen of the Glasgow Stock Exchange Association were or became Chartered Accountants.

It is noteworthy that out of the three hundred and forty six individual biographies many entries exceed half a page, and prominent figures such as Richard Brown (page 55) and Walter Mackenzie (page 125) well exceed a page. There are surprisingly few short entries such as the one given for Thomas W. Galloway (page 82) which reads, 'Not much is known of T. W. Galloway's career save that he spent many years in London, and survived to celebrate fully fifty years as a member'. This situation is a tribute to the author's diligence and hard work in examining source material.

The biographical notes are preceded by an interesting informative section outlining the growth of the accountancy profession. This introduction, which incidentally contains a number of very interesting illustrations, is not confined to the growth of the profession in Scotland. The introduction also briefly refers to the early growth of accountancy in the rest of Great Britain and Europe.

In the appendix there are sections outlining the links between some of the early accountants and well known accountancy practices. This information well complements the information contained in the main text.

The book, produced at the initiative of the Scottish Committee on Accounting History, will be of great benefit to future accountancy historians. It is a tribute to Mr. Stewart, a past President of the Scottish Institute, that he has been able to collect and collate such a wealth of material.

University of Liverpool

Alan M. Hoe

Current Issues in Accounting. Bryan Carsberg and Tony Hope (editors). Philip Allan, 1977. iii + 293 pp. £9 hardback, £4.50 paperback.

This is a good and useful book. It is made up of seventeen essays, commissioned by the editors from members of nine university departments; so, if it did nothing else, it would show what a wealth of

talent is now to be found among Britain's teachers of accounting.

The book's role is to equip first-year students with background reading (and, I may add, it supplies a helpful answer to young people who ask us, before coming to a university, what accounting is all about). It assumes that the student can get hold of text-books on the bread-and-butter stuff, but needs an early taste of what he will learn in later years – of the theories that inspire accounting, of our debt to sister-subjects, and of the various fields of research in which his teachers are delving.

To meet this aim, plainly the essays must be simple yet scholarly, lively yet accurate. For the most part, they are.

The essays begin with descriptive matter – the historical background, the accounting profession (institutes, statistics etc.), standards, and Europe. They then pass on to our topical problems – e.g. price-change, the audit function, tax, and the need to give information to different groups. Thereafter they discuss accounting's links with other subjects – economics, finance, computing, etc. They are all helpful, clear and competent.

Faced with such quality, what is the wretched reviewer to write about? His words must inevitably sound either fulsome or pernickety.

Perhaps my best plan is to skirt round the book's contents, and instead to consider its lacunae – in the hope that such comments may contribute to an even better second edition. I can think of three omissions.

First, there is no chapter on law. Yet law has done more than any other subject to nurture accounting. Much book-keeping can be described as legal arithmetic: the entries are informed by analysis of contract. Bankruptcy and trusts helped early accountants to earn their living (and still sustain many firms); and trusts had a profound influence on our notions of income. The importance of company law needs no stress.

Next, little is said directly about the accountant's daily life. This is a pity: we tend to forget how curious our students are about their future careers, and how hard it is for them to visualise what is going on behind the brass plates and in company accounting departments. Mr. Renshall's chapter on institutes is good so far as it goes; but it does not deal with the individual members' work. To describe this adequately would be difficult. (As historians have found, it is easier to tell of kings and wars than how common folk live.) But the task is surely worth trying. Organisation charts would help. The section on companies should stress the accountant's links with other departments, to make students picture the flow of data from operations to book-keeping – something

that they find hard. (Lecturer: 'Now, where precisely does the cost accountant get the labour costs for this process?' Class: 'In the question'.)

Finally, is it not perhaps a trifle odd that essays on accounting should for the great part (Mr. Mace on tax is an exception) contain no figures, no whiff of the ledger? To this, editors and contributors will as one man retort: 'But you are failing dismally to understand our aim. This, we repeat, is to supply the background of principle'. Okay. But just how far back is background? Would not the authors enrich their discussion by occasionally showing the inter-connections between lofty principles and earthy entries? An imperfect mix (in this book and elsewhere) must enhance the student's suspicion that his teachers find their subject distasteful and unworthy – that a respectable course will scamp the practical. Here plainly is one of the main problems that we teachers must solve. Already a not unusual comment by employers of accounting graduates is that the young gentlemen are capable of anything except keeping accounts. The essays will be doubly helpful if they make us face this issue squarely.

London School of Economics

W. T. Baxter

The Use of Accounting Information in Labour Negotiations. *John R. Palmer.* National Association of Accountants, 1977. v + 71pp.

The needs of employees and trade unions for financial information to use in collective bargaining have been recognised formally in the UK over the past few years by the accountancy profession, by the CBI and by successive governments. Use has been made of available accounting information by the unions themselves, the best documented, most sophisticated examples being the 1971 PEP claim to ICI and the 1970 Ford workers claim, both made by the TGWU. Despite this increasing interest in corporate disclosure to the employee/trade union user group and a growing literature in the area, there has been a remarkable lack of empirical research undertaken in order to provide a base for the development of sound disclosure practice. In consequence, much of the UK reader's interest in this work by Palmer will lie in the questionnaire and interview survey of trade union negotiators, management negotiators and mediators which forms the basis of the booklet.

As a foundation for this empirical study the author reviews the existing American literature which consists largely of the detailed personal experiences and viewpoints of prominent corporate managers, labour leaders and academics. In the main the contributors were found to support disclosure because of its favourable effects on the industrial relations

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within the firm and on the process of collective bargaining itself. The conflict inherent in these situations is modified by the ability of both sides to adopt a problem solving approach when provided with the facts and figures. A minority, however, expressed reservations on the ability of union negotiators to understand financial information and on the propriety of firms disclosing confidential information to this group. Unfortunately Palmer does not explicitly investigate these latter points in his surveys.

The empirical work done is aimed at determining 'the current state of the art of accounting in labor negotiations in the USA'. Respondents were asked about such topics as the use made of accounting information, the availability of data, their ideas on the role of the accountant in this area, possible methods of disclosure and their views on the effects of disclosure on negotiations. A strong demand for accounting information appeared to exist from both sides, a demand as yet, however, unsatisfied by the American accountant who, surprisingly, appears reluctant to 'market' his services and to respond to the needs of these parties for his outputs. His direct involvement in negotiations was not requested, however; rather it was felt that he should fulfil a service role, providing information on demand and making an effort to let the negotiators know what other information should be made available to them. The accountants' role might well be extended to an instructional one as well, for, in the opinion of the mediators interviewed, management negotiators did not have a good command of the accounting data which they used. The labour negotiators emerged well from the study as an interested group wishing a constant, agreed flow of information about the firm rather than the piecemeal provision of data in response to situations arising. Their sensitivity to accounting data provided would even affect the demands which they would make on the firm during negotiations.

On the basis of the survey results, Palmer recommends that the management negotiator should be provided regularly with management accounting information and should be advised on its interpretation and use by the accountant. Company accountants should recognise that there is a demand for their services in this area and should initiate information flows to improve the data available to negotiators. For the union negotiator a 'broad disclosure' is recommended. The composition of his information package is not however detailed or discussed in any depth and this must limit the usefulness of the study for the reader seeking any practical guidance.

While Palmer's work provides some interesting insights into the use of accounting information in

collective bargaining his approach to gathering data is, by his own admission, not based on any scientific method. Two hundred companies of differing sizes, location and industries were 'chosen' from the *Fortune* 1000 list and questionnaires mailed to their management negotiators. Only sixty responses were received. Little information is given on the nature of the responding companies (e.g. size, industry, location) or on the individual respondents themselves (e.g. age, qualifications, experience) and apparently there was no follow-up work done on the non-respondents. Along with twenty interviews (no interviewee details given) these sixty negotiators formed the author's management negotiator sample. In addition the one hundred largest unions were mailed questionnaires but only eleven replied and another nine union negotiators were interviewed (again no background details are given). Only three mediators were questioned. The results of Palmer's survey and his recommendations have to be viewed against this rather sparse background. Future researchers should note that mailed questionnaires may not be the most appropriate research method in this sensitive area. In addition it is rather unfortunate that company accountants were not also included in the survey as it would have been interesting to investigate their ideas on disclosure for this purpose. After all they should be the experts in the provision and use of accounting information.

Palmer's study will, however, provide interesting and valuable reading for those pursuing further research in the area. Many of the major areas worthy of empirical research are identified and his exploratory work will be useful in the formulation of hypotheses which can then be tested on a more scientific basis.

University of Edinburgh

F. Mitchell

J. M. Clarke. *C. Addison Hickman*. Columbia University Press, 1976. xiv + 94pp. \$9.40 Cloth, \$2.40 Paper.

J. M. Clark is best known to accountants for his *Studies in the Economics of Overhead Costs*, published in 1923, which made a seminal contribution to cost analysis, particularly in its advocacy of 'different costs for different purposes'. This book was also one of the author's major contributions to economics, since it was concerned with the effects of high levels of overhead costs on price discrimination, monopoly power and the business cycle. However, J. M. Clark's contributions to economics were much wider than this. Professor Hickman's select bibliography contains six 'benchmark' books, six 'other books of significance', four books of essays and papers, and nearly one hundred papers in academic journals. His range

of interests was extremely broad, covering both theoretical and applied studies (although he would probably have objected to a distinction being made between the two), micro and macro economics, welfare economics, and the methodology of economics. Apart from his work on overhead costs, his most lasting contribution (or, at least, the one which seems to be most important from the perspective of today) was his pioneering work on the acceleration principle, but he made other important contributions to trade cycle theory (including, for example, a crude form of the foreign trade multiplier), to competition theory (particularly the idea of workable competition, which was a development of the ideas of his eminent father, J. B. Clark), and to welfare economics (in which he emphasised the importance of externalities, or, as he described them, 'diffused costs and gains').

Professor Hickman surveys all this, and a great deal more, in the course of 61 pages. The result is a concise essay which gives the reader a very generous rate of return in terms of information per page. Inevitably, conciseness has its price and there are many points where the reader will require elucidation and may be driven to refer to other works, including those of J. M. Clark, but that is surely no bad thing.

The critical tone of the book may be a little bland for some tastes. Professor Hickman makes clear his admiration for his subject, and his main critical contribution is to demonstrate the range of Clark's work by emphasising some of his lesser-known contributions. We are rarely told that there are good reasons why some of these contributions are little discussed today. In some cases (e.g. Clark's idea of Social Control) it is probable that they did not provide theoretical insights or tools of analysis which were of permanent value or which were amenable to subsequent development by others. On the other hand, it is clear that many of Clark's ideas and his style of developing them are merely unfashionable at present and may well become more fashionable in the future. For example, his pleas for mathematical economics to be made intelligible to the non-mathematician and for theory to be grounded in empirical evidence, and his stress on the importance of the psychological and ethical assumptions of economics, would find some support amongst contemporary economists, at least in principle, although this is not always obvious in the practice of economics, as reflected in the content of current economic journals. Long chains of deductive reasoning, untrammelled by empirical or institutional complications are currently in vogue, and this style was anathema to J. M. Clark.

Apart from Professor Hickman's valuable critical essay, the book contains a substantial chapter,

'Clark and his Peers', which contains selected critical writings by Clark on the work of other eminent economists who were his contemporaries. This is fascinating reading and conveys vividly Clark's sharp critical mind and his distinctive methodological position. Finally, there is a nine page Bibliography of the more important critical writings of J. M. Clark.

In summary, this is a concise, stimulating and readable book. For the accountant, its main professional value will be to put Clark's work on overhead costs into perspective, by making clear the author's attitude to economics and to the evolution of the market economy. This, in turn, should serve to emphasise that all ideas and models in accounting contain assumptions, implicit or explicit, about the economic system in which they operate. A behaviourist, and probably, in view of his emphasis on the psychological assumptions of economics, J. M. Clark himself, would add that the choice of economic system, in turn, implies assumptions about society and its individual members.

University of Bristol

G. Whittington

Corporate Financial Disclosure in the UK and the USA. *George J. Benston*, Saxon House, 1976. viii + 206 pp. £5.95.

Professor Benston's study focuses on two related questions: (1) is it desirable that there should be some form of regulation of the amount of information disclosed in published financial reports?, and (2) is it preferable that any regulation should be undertaken by a public agency (the Securities Exchange Commission) as in the United States, or by a mixed system of direct statutory prescription (in the Companies Acts) and of private control (by the Stock Exchange Council) as in the United Kingdom? The study was supported financially by the Research Committee of the Institute of Chartered Accountants in England and Wales and by the Earhart Foundation (neither body can be assumed necessarily to accept the conclusions).

The author begins by arguing that the UK and the USA have similar economic and social structures, so that findings in one country may be assumed to apply broadly to the other. He then proceeds to describe the main benefits and costs attributable to regulation and to evaluate each one drawing on qualitative arguments and on previously published statistical studies (several by Benston himself). A similar procedure is followed to evaluate the relative merits of the systems in the UK and the USA. No new statistical studies were undertaken specifically for this work, but a good deal of material has been collected

describing the disclosure requirements in the two countries and the institutional backgrounds.

The book provides an interesting and challenging perspective on a subject of topical importance. Given the ambitious nature of the enquiry, it is inevitable that many of the conclusions are impressionistic and that few precise answers are available to the questions posed. It would be unreasonable to argue that the value of the study is thereby diminished. However, the study could have been improved by tighter organisation of its theoretical framework. It would have been helpful had the author given a concise statement of the elements of his cost-benefit analysis linking each to a discussion of the research required in principle for its measurement and dealing with the practical difficulties of such measurements. He could then have identified more systematically the shortcomings of the available evidence leaving suggestions for further work. Instead, the discussion of the nature of the benefits and costs is intermingled with evaluation using the evidence that happens to be available, so that the reader is often unsure what reservations the author has about the quality and relevance of the evidence.

Professor Benston discusses with evident sympathy the proposition that market forces should be allowed to determine arrangements for the provision of financial information. He writes (p. 102): '...one would expect managers to provide security holders with information to the extent that the marginal cost of production and distribution of the information is not greater than the marginal value of the information to security holders.' In taking this line, he gives too little attention to the model under which managers are not simply maximisers of shareholders' wealth, but are permitted to pursue other goals in the context of various market imperfections. Some shareholders may indeed be able to use their bargaining power to obtain information of value to them (e.g. institutional investors) but there is the danger, if there are no disclosure laws, that they may obtain such information privately to the exclusion of other investors. The picture of managers using the strength of their entrenched position to deny information to the general body of shareholders who are inarticulate and poorly organised is likely, one suspects, to evoke the response from the author that there is no case for the state to protect such shareholders. However, the problem has implications for the efficiency of resource allocation and deserves fuller treatment in the study.

The possible benefits of disclosure, justifying regulation, are considered under three main headings: 'first, prevention or reduction of fraud, misrepresentation and unfairness to non-insiders; second, improved efficiency in the allocation of resources and in the

operation of security markets; and third, improved government administration and availability of information for the general public and employees' (p. 150). Benston fails to find convincing evidence of valuable benefits under any heading. In one of the most important sections of the book, he reviews a number of studies of stock market reactions to the publication of accounting information. He concludes that investors appear to use accounting reports (as evidenced by the level of market activity around the publication date) but that individual items of information appear not to alter significantly expectations which were held previously. It must be admitted that the failure to find well-defined models relating the publication of accounting information to movements in security prices weakens the case of those who advocate the regulation of disclosure. However, the evaluation of the evidence seems insufficiently developed in the study. If the market is able to anticipate the information content of accounting reports, one should examine the process by which this happens. Possibly investors are making good predictions from the accounting reports of other institutions, or possibly they are obtaining inside information about the content of forthcoming reports: in either case the conclusion might well support regulation. Moreover, the past research has not dealt exhaustively with all available information. It remains possible that the publication of information is useful in ways which have not yet been detected. Finally, it is possible that new types of disclosure would have value. Perhaps criticism should be directed at the details of present requirements rather than at the existence of any requirements. Perhaps it is necessary that regulation should exist for a long period before it begins to converge on an optimal set of rules.

In discussing the disadvantages of a regulatory agency such as the SEC, Benston emphasises the problems associated with the lack of direct political control and the lack of control by market forces. He suggests that the employees of such an organisation are likely to develop objectives which detract from the social welfare, because they will be interested in expanding their budget and engaging in activity which increases their importance with little regard to social benefits.

Benston also suggests that more demanding rules for accounting disclosure could be applied with advantage to the accounts of the SEC itself! In spite of some admitted advantages of the American system – notably flexibility to adapt rapidly to a changing environment – Benston concludes that the present British system is to be preferred.

Although the study seems to suffer from some

shortcomings, it can be recommended as a stimulating treatment of a difficult subject. The book contains much useful descriptive information on disclosure requirements in the UK and the USA as well as the important analysis discussed in this review. It is likely to provide a valuable basis for study by advanced degree level students, and it should persuade those who advocate the formation of an agency in Britain along the lines of the SEC that they should at least review the strength of their case.

University of Manchester

Bryan Carsberg

The Lease-Purchase Decision: How Some Some Companies Make It. W. L. Ferrara. National Association of Accountants and The Society of Management Accountants of Canada, 1978. 49 pp.

It is a coincidence that some time ago this reviewer was asked by *The Accounting Review* to provide his view on Gordon, Miller and Mintzberg, *Normative Models in Managerial Decision-Making* (NAA and SMAC) 1975. That book included nine highly simplified flow charts of normative decision models for key financial decisions. One of these models related to leasing and was, in fact, written by Professor Ferrara. The objective of that book was to provide a distillation of normative models against which to compare decision processes actually used by 'real world' decision-makers. Such an approach to research was long overdue and to be applauded. However, this reviewer saw very little point in producing a separate book of such simplified flow charts which were, for purposes of this research, nothing more than a series of research hypotheses. Ferrara's small book represents the first evidence produced by this project to compare practice with theory and, therefore, is the first output of potential interest to be derived from this project. After reading this report one wonders whether much careful forethought was given to the project at all.

This book reports the results of spending one day with only six companies (three in the USA and three in Canada). The results can be summarised very briefly. Four out of six companies evaluate leases by calculating the internal rate of return implied by the difference between the after-tax lease and purchase cash flows (the quasi-financing method) and comparing that IRR with the after-tax cost of borrowing. The other two companies use a quasi-investment method. This gives rise to Ferrara's comment that 'one of the more interesting items uncovered in this limited study is that practitioners seem to use the quasi-financing approach . . . far more than one would expect given the literature on the subject'. Readers are left to form

their own opinion as to what extent USA and Canadian practice has been captured in a sample of three companies from each country.

Next, the report mentions that there are other considerations to lease evaluation. It is essentially correct in stating that salvage values, life of the lease being less than the life of asset and differences between purchasing and leasing on aspects of property taxes, insurance and maintenance can be dealt with by straightforward adjustment to the technical cash flow evaluations. However, it mentions, but gives no analysis of, neither the differences resulting in financial statements from the use of leasing as distinct from purchasing assets (a difference now substantially abolished in the USA by FASB No 13) nor differences in ownership risk faced by the lessee according to which method of attaining the use of the asset he employs. Given that such reporting and risk differences were highlighted in the flow chart produced in 1975, one wonders why Ferrara did not devote some effort to discovering how the companies took these factors into account. In fact there are also other possible benefits not included in his flow chart. Moreover, Ferrara says the tax system is essentially neutral in the USA (for unspecified reasons leveraged leases are excluded from this study) so the obvious question is why is it that about one fifth of total capital investment in the USA is now thought to be financed by leasing. Surely this suggests that there is much more to evaluating a lease than simple cost calculations produced in this study (and for that matter almost everywhere else in the academic literature). There must be a balancing of cost differences between the different methods of finance against other real (or imagined) advantages and disadvantages of leasing.

In other words this really is a superficial piece of research. Ferrara concludes his booklet by saying some might want a study of a larger sample of companies while others will want 'in-depth studies', but, he says, such a study would take two years whereas his report can be put into use immediately. However, his field research took him six days or thereabouts and it could not have taken more than a day or so to write this report. Apparently a more extensive study has now been commenced by the NAA and SMAC. It has taken a very long time to reach this position.

What is strange is that Ferrara and the authors of the 1975 book are well known and eminent researchers and yet the work published in this project to date leaves so much to be desired and even after three or more years of work is of such a preliminary nature. One can only conclude that they have not devoted much attention and energy to planning and executing

this project in comparison with others they undoubtedly have. It is to be hoped that the empirical evaluation of the remaining eight models and the further evaluation of the leasing model is performed on a far more rigorous basis.

A final note of relevance to UK readers in considering even the limited conclusions of Ferrara's study is that the tax system can, in certain circumstances, work to the *substantial* benefit of lessees *vis-a-vis* purchasers in this country and also there is, as yet, no requirement for lessees to capitalise lease payments as a long term liability in their balance sheets. In addition, in the UK (and I would have thought in the USA too) a clear distinction needs to be made between operating and financial leasing. There are also various other potential benefits to be derived from leasing which cannot be captured in simple discounting calculations and which, I suspect, can only be identified by a very deep analysis of specific lease decisions. Ferrara virtually admits the latter at the end of his book. What is more, he recognised this at the beginning of his research (in his flow chart) and then appears to have done nothing about it. Meanwhile, one still awaits these empirical studies on financial decisions with great interest. If performed properly they can still prove to be a significant development in the study of financial management.

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Cyril Tomkins

A Study of the Relative Usefulness of Six Accounting Measures of Income. *J. Arnold and M. El-Azma*. Occasional Paper 13, ICAEW, 1978. 96pp. £ / .

It has been good to read this monograph. Good because it is further evidence of the considerable research effort which is under way in the UK into the relative utility of various income and value measurements. And good because it is well constructed and readable. This is not to say that it is free of weaknesses and points for debate. However, it reveals the rapid advances now being made in this area in the UK as compared with the traditional research pastures of North America.

Arnold and El-Azma have used a simulation approach to test the degree of association and approximation of six measures of accounting income to two measures of economic income. Using a reasonably simple business situation and varying rates of price inflation, they have attempted to evidence the measures of accounting income which are reasonable surrogates for the ideal (if impractical) economic income. Their results are relatively inconclusive, and require replication and amendment to

the simulation model. Nevertheless, the first step in this particular part of the quest for an improved financial reporting package has been made, and the results of the next stage are to be looked forward to with interest.

The philosophy underlying the study is that of the financial report user and his decision model. Interestingly, a considerable amount of financial reporting research is being undertaken in the UK at the present time (particularly at the Universities of Edinburgh, Lancaster and Manchester), and each project has adopted this approach as its foundation. This, as Arnold and El-Azma rightly point out, is in rather stark contrast to the efficient markets school of thought which has largely dominated American research in recent years.

There are numerous reasons to favour the UK approach and, without being unduly biased, Arnold and El-Azma have specified these clearly. They have not, however, questioned in detail what is meant by the term 'efficient' in the efficient markets hypothesis. The reviewer is of the opinion that it may be akin to the definition of a bit of blotting paper—speedy in absorbing the ink but not very useful otherwise. In this respect, and to their credit, Arnold and El-Azma have been careful not to knock down other research efforts as a means of bolstering their own. They have correctly taken the approach that there is more than one way of achieving the desired result of improved financial reports—all of which have their merits and place in the scheme of things.

The financial report user group which is the subject of the simulation study is that of shareholders. Although on several occasions admitting the existence of other groups, Arnold and El-Azma preferred to use shareholders, presumably because of the relative ease in specifying their decision model. However, it has meant the continued neglect in financial reporting research of other important user groups, and it has locked the researchers into certain problematic assumptions and implications. For example:

- (i) The aim in financial reporting is to produce general purpose reports, capable of satisfying shareholders *and* other user groups.
- (ii) The proprietary approach to financial reporting is the most valid one; and accounting measurements should reflect this.

The first point is specifically suggested by Arnold and El-Azma on page 11 and the second one arises from their use of dividend rather than operating cash flows in their economic value calculations. The two do not appear compatible—if a proprietary approach is being used, then general purpose financial reports (which, in the reviewer's opinion, are entity statements) seem not to be appropriate.

On the second point, there is a considerable double-counting problem when using operating cash flows but, unless this is done, the economic value of the firm is not being calculated. If dividend flows are used instead (as in this study), it is owner's capital (and not entity capital) which is being valued. Arnold and El-Azma make the simplifying assumption of distributing all operating flows in their calculations, but what happens (for example) if no distributions are made? Does the firm have no value because there are no dividends? Or is it simply that its shares would have no value?

The previous point is a further extension of the entity v. equity debate in accounting but, as in this study, it has meant that economic measurements of *equity* income have been compared in the simulations with accounting measures of *entity* income (for example, money historic cost income, business income and current operating profit). Only in the purchasing power-adjusted data does there seem to be comparability—that is, one measure of shareholder income being compared with an equivalent one.

These points for debate are offered because the inconclusiveness of the results obtained by Arnold and El-Azma may be due to lack of comparability. Given the required brevity of this review, there are several other points which readers of the study may wish to pursue but which cannot be discussed at length here. However, the reviewer would like to at least list them for consideration:

- (i) Economic value is a personal concept which is exceedingly difficult (but not impossible) to adapt to the firm. As such, why not leave the valuation to the individual shareholder and merely report the predictive data on which this can be based? Arnold and El-Azma have hinted at this possibility, but no more than that.
- (ii) Are windfall gains distributable? Arnold and El-Azma do not comment on this but imply that they are not by treating only expected income as distributable.
- (iii) Is historic cost data (adjusted by a general price index) really a valuation concept? Arnold and El-Azma state it is, as has a leading UK academic recently in a review in this journal. This reviewer would argue strongly against this notion, along the lines that general price-level adjustments translate money data in order to aid a capital maintenance decision of a proprietary nature.
- (iv) Why reject consideration of cash flow accounting because, as Arnold and El-Azma state, it is not likely to be implemented in the near future? All measures of income used by the authors of this study are based on cash flow accounting, and the economic data depend on it. Nothing is likely to be

considered in the near future if everything that is not in practice now is to be ignored.

The above are points for debate which can be taken as criticisms of the study. They are also indications that the study, if read thoroughly, contains much material for debate and further research. My absolute recommendation is that it should be read by every

thinking accountant. Given the impracticability of such a proposition, I would direct my missionary zeal at all thinking accountants who desire improvements in the present financial reporting function, and have the time to read it thoroughly. They will be well rewarded by such a reading.

University of Edinburgh

T. A. Lee

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Contributors to Accounting and Business Research

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